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Report No: PAD1182

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US$300 MILLION

TO THE

REPUBLIC OF PERU

FOR A

LIMA METRO LINE 2 PROJECT

July 20, 2015

Transport and ICT Global Practice
Latin America and the Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective July 16, 2015)

Currency Unit	=	PERUVIAN NUEVOS SOLES
PEN 3.18	=	US$1
US$ 0.31	=	PEN 1

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AATE	Autonomous Authority of Electric Mass Transit System of Lima and Callao
AFD	French Development Agency - *Agence Française de Development*
BRT	Bus Rapid Transit
CAF	Development Bank of Latin Amer. - *Banco de Desarrollo de América Latina*
DGASA	Directorate General on Socio-Environmental Matters of Ministry of Transport and Communications (*Dirección General de Asuntos Socio-Ambientales)*
CPS	Country Partnership Strategy
DBOT	Design-Build-Operate-Transfer
EDI	Definitive Engineering Studies - *Estudios Definitivos de Ingeniería*
EIRR	Economic Internal Rate of Return
EIA	Environmental Impact Assessment (including the Resettlement Policy Framework)
ESMM	Environmental and Social Management Manual
FIRR	Financial Internal Rate of Return
FM	Financial Management
GDP	Gross Domestic Product
IADB	Inter-American Development Bank
IBRD	International Bank for Reconstruction and Development
INEI	National Institute of Information and Statistics – *Instituto Nacional de Estadística e Informática*
LMR	Lima Metropolitan Region
JICA	Japan International Cooperation Agency
KfW	KfW Development Bank - *KfW Bankengruppe*
MEF	Ministry of Economy and Finance – *Ministerio de la Economia y Finanzas*
MTC	Ministry of Transport and Communication
NMT	Non-Motorized Transport
NPV	Net Present Value
OSITRAN	Supervising Body of Transport Infrastructure Public Investment
PDO	Project Development Objective
Proinversion	Agency for the Promotion of Private Investment in Peru
SNIP	Peru National Public Investment System – *Sistema Nacional de Inversión Pública*
TOD	Transit-Oriented Development

Regional Vice President:	Jorge Familiar
Country Director:	Alberto Rodriguez
Senior Global Practice Director:	Pierre Guislain
Practice Manager:	Aurelio Menendez
Task Team Leader:	Georges Darido

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Lima Metro Line 2 Project (P145610)

PROJECT APPRAISAL DOCUMENT

LATIN AMERICA AND CARIBBEAN

Transport and ICT Global Practice

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Basic Information			
Project ID P145610	EA Category A - Full Assessment		Team Leader Georges Bianco Darido
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]		
Project Implementation Start Date 31-May-2015	Project Implementation End Date 30-Jun-2021		
Expected Effectiveness Date 30-Nov-2015	Expected Closing Date 31-Dec-2021		
Joint IFC No	Joint Level		
Practice Manager/Manager Aurelio Menendez	Senior Global Practice Director Pierre Guislain/Jose Luis Irigoyen	Country Director Alberto Rodriguez	Regional Vice President Jorge Familiar

Borrower: Republic of Peru			
Responsible Agency: Ministry of Transport and Communications (MTC)			
Contact:	Raúl Garcia Carpio	Title:	Director, MTC Transport Concessions General Directorate
Telephone No.:	+51-1-6157800	Email:	rgarcia@mtc.gob.pe
Responsible Agency: *Autoridad Autónoma del Sistema Eléctrico de Transporte Masivo de Lima y Callao (AATE*)			
Contact:	José Zárate Garay	Title:	Executive Director, AATE
Telephone No.:	+51-1-2242444	Email:	jzarate@aate.gob.pe

Project Financing Data(in USD Million)					
[X]	Loan	[ ]	IDA Grant	[ ]	Guarantee
[ ]	Credit	[ ]	Grant	[ ]	Other

Total Project Cost:	5836.00	Total Bank Financing:	300.00
Financing Gap:			

Financing Source	Amount
Borrower	2285.00
IBRD	300.00
IADB	300.00
CAF	150.00
Other IFIs and future operations	1150.00
Private Concessionaire	1651.00
Total	5836.00

Expected Disbursements (in USD Million)

Fiscal Year	2016	2017	2018	2019	2020	2021	2022
Annual	25.00	150.00	125.00	0.00	0.00	0.00	0.00
Cumulative	25.00	175.00	300.00	300.00	300.00	300.00	300.00

Institutional Data

Practice Area / Cross Cutting Solution Area

Transport & ICT

Cross Cutting Areas

[X] Climate Change
[ ] Fragile, Conflict & Violence
[ ] Gender
[ ] Jobs
[X] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Transportation	Urban Transport	100	0%	100%
Total		100		

☐ I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes

Theme (Maximum 5 and total % must equal 100)		
Major theme	Theme	%
Financial and private sector development	Infrastructure services for private sector development	10
Urban development	Municipal governance and institution building	10
Urban development	City-wide Infrastructure and Service Delivery	80
Total		100

Project Development Objective(s)

The objective of the Project is to provide a major east-west axis (Ate-Lima-Callao) of the Lima-Callao Metropolitan Region with a modern and integrated mass transit system that will improve accessibility to jobs and services in the area of influence of the Lima Metro Line 2 and the Gambetta Branch of Line 4.

Components

Component Name	**Cost (USD Millions)**
Support for the Construction of the Lima Metro Line 2	300.00

Systematic Operations Risk- Rating Tool (SORT)

Risk Category	**Rating**
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	High
4. Technical Design of Project or Strategy	Substantial
5. Institutional Capacity for Implementation and Sustainability	High
6. Fiduciary	Moderate
7. Environment and Social	Substantial
8. Stakeholders	High
9. Project Implementation	High
OVERALL	High

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ] No [X]
Does the project require any waivers of Bank policies?	Yes [ ] No [X]
Have these been approved by Bank management?	Yes [ ] No [ ]

Is approval for any policy waiver sought from the Board?	Yes [ ]	No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X]	No [ ]

Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment OP/BP 4.01	**X**	
Natural Habitats OP/BP 4.04		**X**
Forests OP/BP 4.36		**X**
Pest Management OP 4.09	**X**	
Physical Cultural Resources OP/BP 4.11	**X**	
Indigenous Peoples OP/BP 4.10		**X**
Involuntary Resettlement OP/BP 4.12	**X**	
Safety of Dams OP/BP 4.37		**X**
Projects on International Waterways OP/BP 7.50		**X**
Projects in Disputed Areas OP/BP 7.60		**X**

Legal Covenants

Name	**Recurrent**	**Due Date**	**Frequency**
Section I.A.1 (Institutional Arrangements)	X		Throughout implementation

Description of Covenant

The Borrower, through MTC (through AATE) shall maintain at all times during the execution and until completion of the Project a structure with key staff and responsibilities acceptable to the Bank, as described in the Operational Manual, including management and coordination of the Project (including coordination with Co-financers), coordination of the strategy for citizen engagement and communications and the oversight of grievance redress mechanism.

Name	**Recurrent**	**Due Date**	**Frequency**
Section I.A.2 (Institutional Arrangements)	X		Throughout implementation

Description of Covenant

The Borrower, through MTC, AATE and OSITRAN, shall adopt and carry out the Project in accordance with a manual (the Operational Manual), satisfactory to the Bank, which shall include supervision and reporting requirements for the carrying out of the Project, including the following: (i) the description of Project implementation activities and institutional arrangements of the Project, including details regarding the respective roles of MTC, AATE and OSITRAN; (ii) the Project administrative, accounting, auditing, reporting, financial (including cash flow aspects), and disbursement procedures; (iii) the Safeguard Instruments; (iv) the monitoring indicators for the Project; (v) organization and staffing of the finance and administrative units of MTC and AATE; (vi) detailed process and procedures for budget preparation and approval, including coordination between MTC, AATE and OSITRAN; (vii) harmonized financial reporting, including content and format of the joint financial statements; (viii) harmonized auditing arrangements, including single set of audit terms of reference; and (ix) terms of reference for the hiring of the international consulting firm that will assist OSITRAN in the supervision of the technical aspects of

the Lima Metro Line 2 Concession Agreement. In the event that any provision of the Operational Manual shall conflict with this Agreement, the terms of this Agreement shall prevail.			
Name	**Recurrent**	**Due Date**	**Frequency**
Section I.A.3 (Institutional Arrangements)		31-May-2016	
Description of Covenant The Borrower, through MTC shall, not later than 6 months after the Effective Date: (a) prepare and furnish to the Bank a plan already approved for the institutional strengthening of AATE and other national agencies involved in the planning, implementation and supervision of the future Lima Metro network, including the consolidation of teams with adequate capacity to manage and report on, inter alia: (i) status and changes to the Concession Agreement, (ii) loan disbursements, (iii) physical and financial progress of the project, (iv) monitoring, evaluation and reporting of the Project, (v) social and environmental safeguards, (vi) coordinated strategy for social participation and communication; (vii) monitoring mechanisms for dispute resolution; and (b) provide for adequate financing of measures included in said plan.			
Name	**Recurrent**	**Due Date**	**Frequency**
Section I.A.4 (Institutional Arrangements)		31-May-2016	
Description of Covenant The Borrower, through AATE shall, not later than 6 months after the Effective Date: (a) prepare and furnish to the Bank an approved plan, including an implementation schedule, for the multi-modal integration of transport services and accessibility for the initial phase of the Lima Metro Line 2 (Phase 1A and 1B of the Project), and (b) provide for adequate financing of measures included in said plan.			
Name	**Recurrent**	**Due Date**	**Frequency**
Section I.A.5 (Institutional Arrangements)		31-May-2016	
Description of Covenant The Borrower, through MTC and AATE shall, not later than 6 months after the Effective Date, enter into a tripartite framework agreement, under terms and conditions acceptable to the Bank, with the Municipalities of Lima and Callao to establish commitments on, inter alia: (i) plans and mechanisms for the physical integration of the Lima Metro Lines 1, 2, and the Metropolitano BRT and other bus systems; (ii) studies for the establishment of an integrated single fare ticket between Metro Lines 1, 2, and Metropolitano BRT, (iii) the reorganization of feeder bus routes and regulation of public transport services around Lima Metro Line 2, and (iv) plans for the improvement of public spaces and facilities for pedestrian, bicycles and traffic management around stations conforming Lima Metro Line 2.			
Name	**Recurrent**	**Due Date**	**Frequency**
Section I.A.6 (Institutional Arrangements)	X		Throughout implementation
Description of Covenant The Borrower shall cause OSITRAN to select and contract, and thereafter maintain throughout the Project, a supervision firm, independent from the Borrower (Independent Supervision Agency) with experience and qualifications acceptable to the Bank, for the provision of supervision support to OSITRAN, particularly focused on the design, construction, social-environmental and safety management aspects of the Project, all in accordance with the specifications included in the Operational Manual.			
Name	**Recurrent**	**Due Date**	**Frequency**

Section I.A.7 (Institutional Arrangements)	X		Throughout implementation

Description of Covenant

The Borrower shall promptly inform the Bank, following the procedures established in the Operational Manual, of any material modifications to the Lima Metro Line 2 Concession Agreement, including, without limitations, (i) a material extension of the stipulated time for performance of the Concession Agreement; (ii) substantial modifications of the scope of the terms and conditions of the Concession Agreement that in the opinion of the Bank materially affects the obligations set forth in the Loan Agreement; (iii) modifications or amendments to the Concession Agreement that singly or jointly result in an increase of the original value of the Concession Agreement by more than 15 percent; and (iv) a proposed termination of the Concession Contract.

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Conditions

Source Of Fund	Name	Type
Borrower	Article 5.01(a): Independent Supervision Agency[1]	Effectiveness

Description of Condition

The Independent Supervision Agency referred to in Section I.A.6 of the Loan Agreement has been hired.

Source Of Fund	Name	Type
Borrower	Article 5.01(b): Project Operational Manual[2]	Effectiveness

Description of Condition

The Operational Manual has been adopted by MTC, OSITRAN (for those aspects relevant to OSITRAN's role in the Project) and AATE.

Source Of Fund	Name	Type
Borrower	Schedule 2, Section IV B.1.(b)	Withdrawal

Description of Condition

No withdrawal shall be made for payments made prior to the date of the Loan Agreement, except that withdrawals up to an aggregate amount not to exceed $60,000,000 equivalent may be made for payments made prior to this date but on or after February 25, 2015 (but in no case more than one year prior to the date of this Agreement), for Eligible Expenditures.

Team Composition

Bank Staff

Name	Title	Specialization	Unit
Georges Bianco Darido	Lead Transport. Spec.	Task Team Leader (TTL)	GTIDR
Daniel Pulido	Sr. Infrastructure Specialist	Co-TTL	GTIDR
Felipe Targa Rodriguez	Sr. Urban Transport Spec.	Transport Accessibility	GTIDR

[1] OSITRAN, through a UNOPS led competitive procurement process, awarded in April 2015 the contract for the independent supervision consultant to an international consortium of Peruvian, Chinese and Korean engineering companies.

[2] A complete draft of the Project's Operating Manual was agreed on by WB, IADB, CAF and other IFIs in May 2015 and returned to the Borrower for final review and approval.

Bernardo Guatimosim Alvim	Sr. Transp. Economist/ETC	Demand/Econ. Analysis	GTIDR
Tatiana Peralta Quiros	Junior Professional Assoc.	Accessibility Model	GSURR
Daniel Alberto Benitez	Senior Transport Economist	PPP/Regulation	GTIDR
Shomik Mehndiratta	Lead Urban Transport Spec.	Urban Transport	GTIDR
Lincoln Flor	Sr. Transport Economist	PPP/Regulation	GTIDR
Sonia Rousseau-Lopez	Program Assistant	Program Assistant	GTIDR
Steven Farji Weiss	Social Development/ETC	Poverty/Social Dev.	GTIDR
Carlos Alberto Molina Prieto	Social Development Spec.	Resettlement	GSURR
Sarah Keener	Sr. Social Develop. Spec.	Social Development	GSURR
Robert H. Montgomery	Lead Environment Spec.	Environment	GENDR
Raul Tolmos	Environmental Specialist	Environment	GENDR
Abdelaziz Lagnaoui	Sr. Environ. Specialist	Environment	GENDR
Mariana M. Montiel	Senior Counsel	Legal	LEGLE
Blanca Ximena Talero	Chief Counsel	Legal	LEGSO
Jean-Jacques Verdeaux	Lead Procurement Spec.	Procurement	GGODR
Alvaro Larrea	Sr. Procurement Spec.	Procurement	GSURR
Nelly Ikeda	FM Specialist	Financial Management	GGODR
Patricia Hoyes de la Fuente	Senior FM Specialist	Financial Management	GGODR
Maria Virginia Hormazabal	Finance Officer	Disbursements	CTRLD
Gerald Ollivier	Sr. Infrastructure Specialist	Reviewer	GTIDR
Arturo Ardila	Lead Transport Economist	Reviewer	GTIDR
Ajay Kumar	Lead Transport Economist	Reviewer	GTIDR

Non Bank Staff

Name	Title	City
Irene Portabales Gonzalez	Infrastructure TA Consultant	Washington
Fabio Hirschhorn	Infrastructure PPP Consultant	Washington
Jorge Rebelo	Metro Consultant/Reviewer	Washington
Jose Maria Retana	Engineering Consultant	Madrid, Spain
Paloma Ruiz Gonzalez	Infrastructure Consultant	Washington
Elizabeth Dasso	Social Impact Consultant	Lima, Peru
Juan Paulo Zanatta	FM Consultant	Lima, Peru

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments

Peru	Municipality of Lima; Constitutional Province of Callao	Lima Metropolitan Region (LMR)	X		35km of new infrastructure within the LMR from the eastern district of Ate-Vitarte to the Port of Callao in the west and a branch of the future Line 4 to the International Airport and beyond.

I. STRATEGIC CONTEXT

A. Country Context

1. **Peru has seen a recent period of rapid economic growth as evidenced by the annual GDP growth rate of 6.0 percent in 2012 and 5.8 percent in 2013**.[3] Sound macroeconomic management during these years created the fiscal space needed for countercyclical policies to soften the impact of the global economic crisis in 2008-2009. Medium-term and long-term macroeconomic projections are promising with GDP growth estimates of over 5 percent in the 2015-2018 period mostly from private investment and private consumption. Peru is also making significant progress in addressing national infrastructure gaps, as reflected in its position of 7th out of 23 Latin American and Caribbean countries and 61st overall (out of 148) in a 2013 infrastructure ranking.[4]

2. **Economic growth in Latin America as a whole has slowed in the past year due to a combination of external and domestic factors.** On the external side, the weakening of key commodity prices has created leaner times by affecting exports and caused the private sector to curb spending. Domestic policy uncertainties have further depressed confidence in several countries. In Peru, economic activity slowed in the final months of 2014 and the trade balance registered a record annual deficit in December. Decreasing demand and falling prices for Peru's commodity exports will weigh on exports going forward. Slow growth in the manufacturing and construction sectors, as well as subdued private consumption, are also negatively affecting the economy. The Government of Peru (GoP) is hoping to boost growth with a series of large public-private infrastructure projects**.**[5]

3. **Poverty has fallen sharply throughout the country in recent years and there is progress towards reducing inequality.** The national poverty rate in Peru fell from 55.6 percent to 25.8 percent between 2005 and 2013, while extreme poverty was reduced from 15.8 percent to 4.7 percent. Poverty in rural areas has fallen dramatically in the period 2005-2013 from 83.4 percent to 48.0 percent and in urban centers from 48.2 percent to 16.1 percent mainly due to formal job creation, higher incomes, the expansion of social safety nets and labor market strategies for poor and vulnerable groups. Income equality in Peru has also improved, with the Gini Coefficient falling from 0.50 to 0.45 between 2007 and 2012. Similarly, the Lima Metropolitan Region (LMR) has made strides towards improving shared prosperity in the 2004-2012 period as evidenced by the higher mean income growth of the bottom 40 percent (5.4 percent) as compared to overall income growth (4.0 percent). The share of the population under the poverty line in the LMR decreased from 25.1 percent in 2007 to 12.8 percent in 2013, and extreme poverty has become virtually inexistent in the LMR (<1 percent).

4. **However, as urbanization continues in Peru, its major cities face important development challenges and constraints to achieving sustained and inclusive growth**. With Peru's urban population growing at about 1.6 percent annually and the rural population decreasing

[3] All socio-economic data for Peru is from: http://data.worldbank.org/country/peru
[4] World Economic Forum, Global Competitiveness Report, 2013.
[5] IMF (http://www.imf.org/external/pubs/ft/survey/so/2014/CAR101014C.htm) and FocusEconomics (http://www.focus-economics.com/countries/peru).

at 0.4 percent annually, there is a need to implement mechanisms that enable more inclusive access to socio-economic opportunities and public services in the growing urban areas. This is particularly important in the LMR, comprised of the adjacent jurisdictions of the Metropolitan Municipality of Lima and the Constitutional Province of Callao, having grown rapidly in the past decade to over 9 million inhabitants (29 percent of Peru's population). While significant progress has been made recently in reducing poverty, the LMR still contains large concentrations of low-income groups and significant socio-economic disparities. In the LMR, there are 1.3 million people considered poor and an additional 1.7 million considered vulnerable.[6] In response, the GoP has an ambitious urban development agenda to further reduce poverty and boost productivity, including infrastructure investment aimed at providing greater access to employment opportunities, basic services, and improved environmental protection.

B. Sectoral and Institutional Context

5. **Spatial development patterns and inadequate transport services are hampering the productivity of Peru's urban agglomerations, particularly constraining the poor.** In the LMR, the combination of a dispersed pattern of urbanization and the lack of high-quality public transport services on an integrated network is reinforcing social-spatial inequalities (mismatches) by limiting access to urban centers where a majority of formal jobs, education, health and other services are available. Low-income households live predominantly in the urban periphery with poor quality access to these centers and, consequently, have to make a considerable effort in terms of travel times or travel expenses to reach these destinations or do not make the trip at all.[7]

6. **Current urban mobility trends in LMR are not sustainable in part because the public transport network is very limited or of poor quality.** The LMR is growing rapidly and its major transport corridors generally exhibit slower travel speeds or higher negative externalities relative to peers. Part of the reason for this is a very limited mass transit network– one Bus Rapid Transit corridor (the *Metropolitano* BRT) and an elevated rail line (as known as Metro Line 1 or *Tren Eléctrico*), which carry about 1 million trips per day but account for only 9 percent of all public transport trips in the LMR.[8] About half of all 22.3 million daily trips (including all modes and trips on foot) and the vast majority of public transport trips in the LMR are made on the conventional system of largely unregulated, low-capacity vehicles that compete for customers on the street. There are approximately 31,000 buses, microbuses, and vans operating in Lima and Callao (most of them 15 to 20 years of age) on more than 560 routes that generally lack public transport facilities such as bus lanes, terminals or proper stops. These vehicles share the road with an increasing number of private cars, taxis and mototaxis (accounting for 23 percent of total trips) which are often seen as a superior alternative by those who have a choice. As a result, the vast majority of urban roads have high levels of traffic congestion with low travel speeds, and there are significant impacts in terms of lost productive time, operating costs, pollution, as well as fatalities and economic loss related to road accidents.

[6] Vulnerability is defined as monthly incomes of between 330 and 550 Soles, which is only slightly above the monetary poverty line level and just 23 to 40% of the average household income in the LMR.

[7] See Annex 7 for a detailed analysis of travel patterns. Travel and household surveys in LMR show that the people in the two lowest income quintiles make 30% fewer trips for work, school, or other purposes than people in the top three income quintiles, in large part due to high travel times and/or high travel expenses as a share of income.

[8] There are currently 11 million daily trips in public transport in LMR made up of conventional buses/minibuses/vans, BRT, and Metro Line 1.

7. **Strengthening the mass transit network and related policies are essential to allow the LMR to realize its economic potential in a socially inclusive manner.** Investments in mass transit at the metropolitan level need to be complemented by institutional reforms and policies that involve multiple jurisdictions and entities at the national and local levels. The performance of the two existing mass transit lines illustrates the potential to alleviate constraints in the LMR. Travel time savings on these trunk lines combined with integrated feeder services, regulation of competing modes, accessible stations, and affordable fares have led to high and growing patronage. The Municipality of Lima implemented a 26-km exclusive busway in a north-south alignment and operating approximately 300 articulated natural-gas buses and an extensive feeder bus network (the *Metropolitano* BRT) with US$45 million in co-financing from the World Bank (Lima Urban Transport Project, P035740). Since its opening in 2010 and as a result of its higher level-of-service compared to conventional modes, *Metropolitano* ridership has grown steadily and is currently reaching nearly 700,000 passengers per day. This demand exceeds its capacity in peak hours and has prompted the Municipality of Lima to propose expansion plans. Metro Line 1, a 34-km elevated rail transit line developed by the GoP on a different north-south alignment from the BRT, started limited operations in 2010 and was recently extended into the San Juan de Lurigancho district. The ridership on Line 1 is also growing steadily, currently averaging above 300,000 daily passengers, and operating at available capacity in peak periods. This growing demand for mass transit services supports the case for more public transport investments in the LMR, particularly on an east-west alignment where currently no high-capacity infrastructure or services exist.

8. **In December 2010, with the aim of expanding mass transit provision, the GoP approved a Metro Network Plan for Greater Lima and Callao by Supreme Decree (D.S. N° 059-2010-MTC).** This Plan includes Metro Line 1 and five new Metro lines totaling 168 km. Following the results of a pre-feasibility study, the GoP approved a new subway line consisting of 27.3-km of Line 2 and a 7.7-km segment of Line 4 as the top urban transport priority (known together as the Metro Line 2 Project). The selected alignment for Line 2 runs from the district of Ate-Vitarte in the extreme east of the LMR to the maritime port of Callao in the extreme west and the selected Line 4 segment consists of a northern branch that links Line 2 to the international airport and beyond in the Province of Callao.[9] Metro Line 2 will intersect Metro Line 1, the *Metropolitano* BRT, and future Metro Lines 3 and 6, with an opportunity to ensure physical, operational and tariff integration in a multimodal transit system.

9. **In March 2012, the Ministry of Transport and Communication (MTC), as the Government's representative, announced that Metro Line 2 would be implemented through a DFBOT (design-finance-build-operate-transfer) concession contract.** The selection process was carried out by Proinversion, a specialized national agency under the Ministry of Economy and Finance (MEF) in charge of promoting private investment and with vast experience in developing Public-Private Partnership (PPP) projects in Peru. The Project feasibility study and preliminary designs were developed by Proinversion with the support of a consortium of financial and technical consultants.

[9] Maps of the future Metro Network Plan and the Line 2 alignment are in Annex 8.

10. **In October 2013, MTC approved the Metro Line 2 Feasibility Study, including a preliminary design and a maximum budget for government contribution.** The preliminary design and budget were published by Proinversion with the bidding documents and a draft concession contract. Despite prequalifying three international consortia for bidding, Proinversion received only one bid but the process was deemed by the GoP as valid and transparent since the other prequalified firms sustained an interest until just before the proposal deadline and the winning bid was under the maximum budget. The GoP awarded the 35-year concession in March 2014 to a private consortium and the concession contract was signed by MTC in April 2014.[10] Once signed, OSITRAN (*Organismo Supervisor de Inversiones en Transporte*) assumed the responsibility for overseeing the execution of the contract as the national entity under the Council of Ministers in charge of regulating transport PPP infrastructure in Peru. The *Autoridad Autónoma del Sistema Eléctrico de Transporte Masivo de Lima y el Callao* (AATE), an agency under the MTC created in 1986 for the purpose of planning, coordinating, implementing and supervising the *Tren Eléctrico* (Metro Line 1), also has an important role in the Line 2 Project as the technical implementing agency of the owner (MTC) and leading the effort on expropriation, resettlement and resolution of interferences with utilities or other obstacles to implementation.

11. **The Metro Line 2 Project is intended to be part of a metro transport strategy to include institutional reforms and complementary future investments in the LMR.** With the implementation of Metro Line 2, the MTC is seeking a more coordinated approach to the currently fragmented institutional framework for urban mobility in the LMR. Specifically, AATE's role is being expanded to ensure the integration of Line 2 with the future mass transit network in coordination with relevant agencies and stakeholders in the LMR, while MTC is studying the creation of a Metropolitan Transport Authority with financing mechanisms. This effort is being coordinated with municipal governments and is supported by technical assistance activities from the World Bank and other partners.[11]

C. Higher Level Objectives to which the Project Contributes

12. **Linkage with Country Partnership Strategy (CPS).** As part of the Peru Country Partnership Strategy for FY12-FY16 (Report No 66187-PE) discussed by the World Bank Board of Executive Directors on February 1, 2012, the Bank has been supporting the GoP in supplying more accessible social services and delivering more quality public infrastructure. The GoP's plan is to maintain sound macroeconomic policies while creating the conditions that generate better economic opportunities, particularly for the most vulnerable. Investments in public transport are well aligned with the four main objectives of the CPS: (i) increased access and quality of social services; (ii) connecting the poor to services and markets; (iii) sustainable growth and productivity; and (iv) improved public sector performance for greater inclusion. A strategy of reforms and

[10] The winning consortium, "*Consorcio Nuevo Metro de Lima*," is led by Iridium Concesiones de Infraestructura S.A. (Spain), and is also composed of Cosapi S.A. (Peru), Salini Impregilo S.p.A. (Italy), Vialia Sociedad Gestora de Concesiones de Infraestructura S.L. (Spain), Ansaldo Breda SpA and Ansaldo STS SpA (Italy). Annex 3 includes details of the procurement process. Annex 2 describes the concession's contractual and financing arrangements.

[11] More details on the strategy and initial activities are included in Annex 2 (Section H). The World Bank is currently supporting this strategy through trust funds including a PPIAF grant (P125860) on Institutional and Technical Support to the Lima Metro Lines 2&4, and an SFLAC Grant (TF018935) approved in December 2014 for supporting Metro Projects in Latin America. The partners involved in the complementary technical assistance activities in LMR include IADB, CAF, AFD, KfW and JICA.

investments in integrated and accessible mass transport systems, including the Lima Metro Line 2 Project, would contribute to these goals by: (i) decreasing commuter travel times, lost productive time and operating costs; (ii) providing improved access to socio-economic opportunities that can contribute to a better quality of life especially for the poor and vulnerable; (iii) reducing negative externalities for society relative to existing road-based transport; and (iv) creating a backbone for urban transport integration and future economic development in the Lima-Callao Metropolitan Region.

13. **The Project, as part of a long-term metro transport strategy in LMR, is fully aligned with the Bank's goals of reducing poverty and boosting shared prosperity.** Metro Line 2 will directly contribute to the development of a high-quality and more climate-friendly mass transport option. The provision of more efficient and safe urban transport options represents an important step in promoting more inclusive and sustainable growth. The development of Metro Line 2, if well integrated with other mass transit, road-based and non-motorized modes in a convenient and affordable system, can also help reduce income-based inequalities and spatial mismatches in the LMR primarily through three dimensions of enhanced accessibility— regional, local and universal—detailed further in Annex 7 and below:

a. First, increasing access to regional socio-economic opportunities (e.g., job markets, hospitals, schools, cultural venues, etc.) helps peripheral areas where the poor tend to live and that otherwise could not be reached within acceptable travel times or travel budgets. This regional dimension includes access and transfer times and costs, thus Metro Line 2 will require the design and implementation of a multimodal integration plan including a feeder transit system and an integrated and affordable fare policy.
b. Second, local accessibility generated by surface improvements around mass transit stations has the potential to improve living conditions by transforming the built environment (infrastructure) of surrounding neighborhoods through complementary investments. These investments usually have a broader objective of decentralizing the economic and social opportunities in the city, taking advantage of the accessibility benefits in station areas by providing high-quality public spaces, safe crossings, and other elements of vibrant and compact communities where people can safely walk, live, work, shop and play.
c. Third, a universal access dimension by which those with mobility impairments and other vulnerable groups—such as persons with disabilities, the elderly, pregnant women— can enjoy greater mobility and accessibility to social and economic activities. This approach may also address security concerns that some women face in their daily commutes.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

14. **The objective of the Project is to provide a major east-west axis (*Ate-Lima-Callao*) of the Lima-Callao Metropolitan Region with a modern and integrated mass transit system that will improve accessibility to jobs and services in the area of influence of the Lima Metro Line 2 and the *Gambetta* Branch of Line 4.** The Project will be implemented in phases and once completed the area of influence will include 13 districts (9 in the Metropolitan Region of Lima and 4 in the Province of Callao).

B. Project Beneficiaries

15. **The Project's expected area of influence includes a population of over 2.3 million people.** The 35-km alignment will run from the district of Ate-Vitarte, one of the easternmost and poorest districts in the LMR with some 576,000 inhabitants, to the Province of Callao in the west where close to 1 million people reside. Line 2 will also traverse many central business districts where a significant number of jobs, services, and amenities are located.[12] The direct beneficiaries are the Line 2 users, who will be monitored by income, gender and other characteristics through ridership and other travel surveys. A daily ridership of between 360,000 to 660,000 passengers is expected with the completion of the Project depending on the level of services, station accessibility, and integration with the rest of the public transport network.[13] The Project is estimated to save the average user in the Line 2 corridor about 34 percent of the travel time it currently takes to complete a journey and increase the number of jobs within commuting range. Other longer-term benefits for the residents of LMR (indirect beneficiaries) are expected in the form of reduced externalities associated with congestion and motorization along the corridor (e.g. reduced vehicle emissions including local pollutants and greenhouse gases, and traffic accidents).

C. PDO Level Results Indicators

16. The proposed outcome indicators to track the progress in achieving the development objective are:[14]

- **Mobility:** Change in travel times for public transport users in area of influence of Metro Line 2, including transfer and access time.
- **Accessibility:** Change in the number of jobs reachable by public transportation within a 60 minute one-way commute in the area of influence of Metro Line 2.
- **Ridership:** Passengers traveling per day on the operational segment of Metro Line 2, differentiated by income level and other user characteristics (such as gender, mobility-impairment, previous modes used).
- **Integration:** Number of major Metro Line 2 stations with physical integration and fare system interoperability to facilitate transfers.
- **Engagement/Acceptability:** (i) Number of citizens engaged in station accessibility design activities; and (ii) Percentage of Metro Line 2 users satisfied with services, differentiated by income level and other user characteristics (such as gender, mobility-impairment, previous modes used).

III. PROJECT DESCRIPTION

A. Project Component

17. **The Project consists of a single Component: "Support for the Construction of the Lima Metro Line 2".** The Metro Line 2 Project includes the implementation of 35 Km of new urban rail infrastructure, to include the support for the provision of the following: (i) the

[12] These 13 districts contain about 310,600 registered firms (38% of the LMR total), most of which are in the service sector; 24% of total educational establishments and about 26% of health facilities in the LMR.
[13] Please see discussion of demand forecasts and assumptions within the economic analysis described in Annex 6.
[14] The PDO and results indicators are fully consistent with the objectives established by the GoP and the other IFIs in the joint Project Operational Manual.

construction of 35 stations with, at a minimum, physical integration to the existing Metro Line 1 and *Metropolitano* BRT; (ii) construction of approximately 27.3 Km of tunnel along the Line 2 corridor with one rail yard; (iii) construction of approximately 7.7 Km segment of the future Line 4 branch with one rail yard; and (iv) the provision and installation of the necessary rolling stock, electrical, control, telecommunications, and fare systems for operation of the Metro Line 2. The Project will be entirely underground with approximately 32 shafts for ventilation and emergencies, one additional emergency shaft, two rail yards, and electromechanical, structural and rail facilities.

18. **The Project will be implemented under a single Concession Agreement for the Lima Metro Line 2, including the Av. Faucett-Av. Gambetta branch of the future Metro Line 4.** The Concession Agreement between MTC and the winning concessionaire, signed on April 28, 2014, encompasses the design, financing, construction of civil works, provision of rolling stock, and operation and maintenance of the new infrastructure over a period of 35 years corresponding to the DFBOT modality (a fully-bundled PPP). As per Peruvian regulations, the contract constitutes a "Co-financed Concession", defined as a PPP in which the Government makes a capital contribution towards an economically viable project in order to make it financially viable. While Peru has a great deal of experience with PPPs and an appropriate regulatory framework, the Metro Line 2 Concession Agreement is one of the largest public transport contracts in the world and the first of its kind in Peru.

19. **The signed Concession Agreement establishes the distribution of risks and responsibilities between the Concessionaire and the GoP.** In essence, the Concessionaire assumes the risks of design, construction, and operational performance[15], while the GoP is primarily responsible for and assumes the risks related to land acquisition/resettlement, demand (fare revenues), unforeseen geological conditions, chance finds, and unforeseen interference with utility networks. The features of the Concession Agreement are discussed in detail in Annex 2 (Section B).

20. **The Project will be implemented in phases**.[16] The initial segment to be implemented (Phase 1A) will include about 4.9 km of line, 5 stations, a rail yard and test tracks in the area of the future Santa Anita station in the eastern part of the LMR. Phase 1B would add approximately 11km of line and 11 stations from the easternmost district of Ate-Vitarte to the center of Lima. The Concessionaire is carrying out the final designs for the Project and has recently initiated the construction of Phase 1A. Land acquisition and expropriation (led by AATE) have been completed for Phase 1A and are underway for Phase 1B. A detailed description of the Project and phasing is provided in Annex 2 (Section C).

[15] To accomplish the objective of the Concession Agreement, the Concessionaire will enter into an Engineering, Procurement and Construction (EPC) Contract with a Consortium made up of some of the same firms that are shareholders of the Concessionaire: Dragados (Spain), FCC (Spain), Salini Impregilo (Italy), and Cosapi (Peru) for construction, and Ansaldo Breda (Italy) and Ansaldo STS (Italy) for systems and rolling stock. In addition, the Concessionaire will also enter into an agreement for operational advice with Metro de Madrid (Spain). These companies have the experience and track record required for the implementation of the Project.

[16] Project implementation is divided into four phases: Phase 1A with 5 stations, Phase 1B with 11 stations, Phase 2A with 11 stations, and Phase 2B with 8 stations for the Line 4 Branch; described in detail in Annex 2.

B. Project Financing

21. **The lending instrument requested by the Government of Peru is an Investment Project Financing (IPF).** An IBRD loan of US$300 million is proposed, representing about 5 percent of the GoP's estimated contribution to the overall Project. The GoP has requested financing from the World Bank and other International Financing Institutions (IFIs) to support their contributions to the Line 2 concession contract as project implementation advances. This phased financing approach has been successfully used in other World Bank-financed transport projects and would permit possible complementary financing for the same Project in the future. The loan associated with this operation is expected to be disbursed before Project completion and against the GoP payment for civil works, systems and/or rolling stock associated with the initial phases of Project implementation. According to the current Project schedule, the construction of Phase 1A is expected to be concluded in two years. The implementation of the other three phases of the Project is expected to take 5 years according to the current schedule.

Project Cost and Financing

22. **The capital cost estimate for the Project is US$5.836 billion, of which US$4.185 billion are expected to be contributed by the GoP and the remaining US$1.651 billion financed by the Private Concessionaire.** This estimate includes the GoP's initial estimate for land acquisition and resettlement of US$489 million. As indicated in the table below, the expected sources of funding for the Project include the public treasury and co-financing from several IFIs to be requested in phases as Project implementation advances.[17]

Estimated Sources of Funding for Metro Line 2	Millions USD	% Financing
Total Public Financing by the GoP	***4,185.00***	***71.7***
Total Foreign Debt	**1,900.00**	**32.6**
IBRD (2015)	300	5.2
IADB	300	5.2
CAF	150	2.5
Other/future IFI loans	1150	19.7
Public Treasury	**2,285.00**	**39.1**
Concessionaire (Private Financing)	***1,651.00***	***28.3***
Total Estimated Cost	**5,836.00**	**100%**

23. **The GoP currently has adequate resources to provide the necessary counterpart funds for implementation and plans to seek additional IFI resources as needed in the future**.[18] The Concessionaire will also raise capital to fund investments in infrastructure, rolling stock and systems. This private financing will be backed by government payments against the completion of predefined milestones during the construction period (short-term financing in the form of a revolving credit line) and by deferred payment certificates during the operational period (long-term financing based on the securitization of these certificates) as described in Annex 2.

[17] According to the GoP, other IFIs that will co-finance Metro Line 2 include: IADB, CAF, KfW, AFD and EIB. An IADB loan for US$300 million was approved in December 2014 and a CAF loan for US$150 million was approved in December 2014.

[18] Annex 6 includes a financial and fiscal analysis of the Line 2 investment.

C. Lessons Learned and Reflected in the Project Design

24. **The Project design and the Bank's complementary support are based on the experience gathered from several Bank-financed projects in the urban transport sector, detailed in Annex 2 (Section E).** The main lessons include the importance of coordination between the different levels of government and the alignment of interests between jurisdictions for the successful implementation of a Metro project. There are social and environmental impacts and inherent risks with underground civil works, traffic disruptions and involuntary resettlement that must be managed carefully. Strong coordination among financiers is also needed, so a joint Project Operational Manual has been developed and the IFIs co-financing the Project are actively coordinating on an implementation support plan and complementary activities to enhance the Project.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

25. **The Concession's awarding authority is the MTC, and AATE is the line agency charged with the technical management of the Project.** The Concessionaire is the primary entity to implement Project engineering design, construction, operations and maintenance, while OSITRAN is responsible for concession contract supervision. AATE will supplement its own resources with external consultants and prepare an institutional strengthening plan to improve implementation capacity. OSITRAN's supervision of engineering design and construction will be executed by its staff and supported by specialized external consultants, including an Independent Supervision Agency. OSITRAN's duties include: (i) reviewing the concessionaire's designs and execution plans (including any changes the concessionaire may propose and its impact on budget, schedule, quality); (ii) monitoring the execution of the works (including environmental, health and safety), controlling the schedule and approving final designs; (iii) monitoring the testing and commissioning phase for infrastructure, systems and rolling stock; and (iv) monitoring the beginning of the service operations.

26. **The Bank, in coordination with partners, is supporting MTC and AATE in developing a multimodal integration and accessibility plan and partner agreements for Line 2 as part of a metro transport strategy**. This plan may include complementary policies and relatively low-cost interventions that enhance project outcomes that are defined with citizen engagement and implemented in parallel to the design and implementation of Metro Line 2. The Bank and partner IFIs are supporting the development of key elements of this plan to be implemented by MTC and AATE. More details on the proposed plan are included in Annex 2 (Section H). The GoP is also expected to enter into a tripartite framework agreement with the Municipalities of Lima and Callao to facilitate the implementation of this plan in partnership with local governments. The agreement is intended to establish mechanisms for ensuring the physical, fare and operational integration of Line 2 with other public transport services, and to improve public spaces and facilities for pedestrian, bicycles and traffic management around future stations in a manner that enhances project outcomes.

27. **Despite a good level of capacity within MTC, AATE and OSITRAN in their respective disciplines, an institutional strengthening plan is also required as part of a metro transport strategy.** This plan should address resource gaps, ensure qualified technical teams, and clarify mandates between national agencies involved in planning, implementing or supervising the future Lima Metro Network. AATE has created a management unit and an integration and accessibility committee to manage activities complementary to Line 2 and coordinate among Project stakeholders. This unit is intended to coordinate studies, pilot activities, troubleshoot problems and resolve technical issues with the support of consultants and in close coordination with the Concessionaire, MTC, OSITRAN, and other national and local government agencies. This unit is also liaising with financiers and local governments to identify complementary investments and technical assistance activities.

B. Results Monitoring and Evaluation

28. The project's monitoring and evaluation plan is detailed in Annex 1. Field assessment and user surveys are expected to be collected within one year of each project phase becoming fully operational to estimate the Project's impacts in terms of travel times, accessibility, ridership, level of integration, and acceptability. AATE will be responsible for most data collection and reporting in a coordinated fashion with all IFIs as defined in the Operational Manual. The Bank has developed a methodology and tool for estimating the accessibility indicator. This is described in Annex 7, along with the data requirements.

C. Sustainability

29. **Active contract management is needed to ensure the successful construction, operation and maintenance of the Metro Line 2 Project.** The financial commitment of the GoP to fully finance the Project and any justified cost overruns are reflected in the signed Line 2 Concession Agreement and supported by Peruvian law. It is expected that the GoP will provide the needed funds for the complete and uninterrupted execution of the Project even if possible future IFI funds do not materialize. While the Project's feasibility study suggests that the cost of remunerating the concessionaire for operating Line 2 to be largely covered by fares collected from users, the demand and revenue risk is entirely with the GoP.[19] The GoP is currently in a solid position to cover Line 2 concession payments and is expected to cover any shortfall in capital investment or operating subsidies if the ridership and financial projections for the Project do not materialize. Annex 6 includes a financial and fiscal analysis of the Line 2 investment.

30. **The implementation of a metro transport strategy in parallel with Project implementation by the GoP is key to maximizing outcomes and enhancing the sustainability of the investment.** The successful implementation of the Metro Line 2 Concession Agreement by itself may not realize the full potential of the Project to benefit poor and vulnerable groups or in the outer fringes of the urban areas, where low-income settlements are concentrated and where commutes in the LMR tend to be the longest, because of a lack of a feeder bus system or affordable fare policies. For this reason, the GoP has agreed to develop a multimodal integration and

[19] The Metro Line 2 PPP was structured in this manner under the assumption that no private consortium would bid if demand or revenue risks had to be shared for this greenfield subway and first-of-a-kind project in Lima.

accessibility plan for Line 2, sign agreements with local governments, and implement an institutional strengthening plan as part of the implementation of a metro transport strategy.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

31. **The overall risk rating is high considering the scale and nature of this complex project.** Several risks are deemed substantial or high, including: (i) deficiencies in institutional capacity and multi-agency coordination needed to properly design and manage the project's costs, schedule and quality; (ii) the need for complementary sector strategies and policies for sustainability that require agreements with local governments; and (iii) the inherent environmental and social impacts involved in underground construction with involuntary resettlement and major traffic impacts. The GoP is responsible for land acquisition and resettlement, approving final designs, unforeseen conflicts with utility networks, chance finds and geological conditions, and all fare revenue risk. In order to mitigate these risks, the GoP has agreed to: (i) hire an Independent Supervision Agency to ensure the design and construction meets the requirements of the Concession Agreement; (ii) implement an institutional strengthening plan for the main agencies involved in Metro planning, implementation and supervision; (iii) define a multi-modal integration and accessibility plan for the initial phases of Metro Line 2; and (iv) negotiate a tripartite framework agreement with the Municipalities of Lima and Callao to include plans and mechanisms for physical, fare and operational integration with other public transport services and improvement of public spaces and access facilities for pedestrian, bicycles and traffic management around stations conforming Lima Metro Line 2. A detailed description of the risks and mitigation measures are set out in Annex 2 (Section G).

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

32. **An economic analysis of the Project (Annex 6, part I) estimating the quantifiable benefits and costs of the project yielded an economic internal rate of return (EIRR) of 8.9 percent and a NPV of US$459 million with a discount rate of 6 percent.** This base case assumed a 30 year horizon using a conservative demand assumption of 360,000 passengers per day in the first year of full operation and a 3.5 percent ridership average annual rate of growth. Sensitivity analyses detailed in Annex 6 confirm that the level and rate of ridership growth are key drivers of Project benefits. The net present value of the project would be zero if the capital costs were to increase by more than 45 percent or operating costs were to increase by more than 186 percent under the base assumptions of demand and a discount rate of 6 percent[20]. A further

[20] In the past, Bank infrastructure projects often assumed a 12 percent discount rate, but a much lower rate between 4 percent and 8 percent has been observed recently for large public transportation projects with long-lived benefits. A World Bank policy paper (Lopez, Humberto, "The Social Discount Rate: Estimates for Nine Latin American Countries", Policy Research Working Paper 4639, World Bank, 2008) also suggests lower discount rates for investment projects with similar characteristics in Peru and other countries of the region because social benefits materialize over the long-run. Moreover, it is not possible to quantify all positive externalities from this Project,

sensitivity analysis was performed and for a 10 percent discount rate consumer benefits would have to increase by 11 percent or capital expenditure (CAPEX) decrease by 12 percent to reach a positive NPV. The project economic flows for the Base scenarios of demand (360,000 passengers per day) and annual demand growth (3.5 percent), as well as simulations with other discount rates are presented in Annex 6. Benefits beyond the direct consumer surplus generated by the Project, such as the potential for GHG reductions, have also been estimated.

33. **A financial analysis (Annex 6, part II) estimated the net cash flows for the Metro concession period (2015-2048) and yielded a financial IRR (FIRR) of approximately -3.9 percent using the same base demand assumptions.** This negative FIRR is expected for a public investment such as Metro Line 2 and reflects the very substantial capital costs in the initial years that cannot be fully recovered from fare revenues during the evaluation period. The vast majority of international experience in this sector suggests that fare revenues will not cover capital costs and are often insufficient to cover operating costs. The annual fiscal costs to be incurred by the GoP during the first years of implementation range from US$467 million to about US$1.4 billion. Nevertheless, the Project's financial analysis suggests that the Project will be cash-positive after 2020 as passenger fare revenues should exceed operational costs if base demand and fare assumptions hold.

B. Technical

34. **The GoP's approved studies conclude that the Project is feasible from a technical, economic, and financial perspective.**[21] The scope of the Feasibility Study for the Line 2 Project was essentially limited to an underground rail line from Ate-Vitarte in the east to Callao in the west and a connecting Line 4 northern branch to the International Airport. The Line 2 alignment is consistent with the east-west corridor identified by other independent studies[22] as the highest priority for major public transport investment. Although the Bank was not involved in the Project's Feasibility Studies or preliminary design, the Bank's appraisal confirms that the Project is feasible. The Bank's analysis of the Project's potential demand, detailed in Annex 6, estimates that about half of the ridership (estimated in the Feasibility Study at 660,000 passengers per day in the first full year of operation) will depend on comprehensive physical, fare and operational integration that requires a multimodal integration and accessibility plan. Since essentially all demand and revenue risk is retained by the GoP, it will be important for the sustainability of the Project for MTC, in partnership with local governments, to also implement: (i) reforms to the conventional public transport system; (ii) a reorganization of existing and future bus routes to feed Line 2; (iii) an affordable fare policy and integrated system; and (iv) complementary local accessibility projects around station areas. Although these measures are not financed directly by the proposed Project, the GoP has committed to studying and addressing these issues with technical support from the Bank and other IFIs.

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particularly as it is the initial section of a larger transport network with long-term benefits and possible spill-over effects. For these reasons, a discount rate of 6% was deemed appropriate for the sensitivity analysis, which is detailed in Annex 6.

[21] Feasibility Study and Summary approved by the GoP in October 2013 and publicly available on the Proinversion website: http://www.proyectosapp.pe/RepositorioAPS/0/2/JER/LINEA2_TREN_ESTUDIOS/A9_Factibilidad_Viable/A_9_1_vol_I_RE.pdf

[22] Study to Integrate and Rationalize the Public Transport System in Metropolitan Lima (2010) supported by GEF Lima Transport Project, P074021, and JICA Lima Urban Mobility Study (2010).

35. **The Bank's analysis of project capital and operating costs based on the available preliminary designs and the winning bid suggests that these costs are generally in line with recent international experience for similar projects.** This analysis considered subway projects with similar design specifications and major cost components or drivers such as passenger design capacity, number and size of stations, tunnel and platform dimensions, evacuation systems, advanced signaling and control systems (including driverless operations, platform doors, and telecommunications), and local conditions (expected soils and seismic protection). Despite the fixed-price nature of the Line 2 Concession Agreement, international experience with similar projects suggests that significant cost increases are common between the design and construction stages, primarily due to unidentified soil conditions, land acquisition, resettlement and interferences with public utilities.

C. Financial Management

36. The financial management responsibilities will be shared between (i) the Ministry of Transport (MTC) and AATE, with the MTC responsible for registering and executing project budget, as well as for management and administration of fiduciary fund that will finance the payments of the PPP, while the AATE will be in charge of contract administration, including recording and accounting for project transactions, and preparation of financial reports and disbursement requests to different financiers to be issued and submitted by the MTC. Given that the project will use several sources of financing, there is agreement to set up a fiduciary fund (*fideicomiso*) in Citibank in order to ensure strong budgeting, accounting and funds flow arrangements, as well as internal controls that support timely and accurate recording of project transactions. In addition the reporting requirements that will be detailed in the Operational Manual make provisions for reliable information for monitoring and supervision purposes. The remaining financial management risks to the operation are (i) an even request of funds across the financiers from MTC and AATE; (ii) the risk of availability of local counterpart financing related to future income flows; and (iii) accurate and timely forecast of future funding needs to ensure sufficient liquidity for payments to the concessioner. The financial management and disbursement arrangements are reflected in the Operational Manual for the Project that has been reviewed and agreed with all financiers of the project and is a condition for effectiveness.

D. Procurement

37. **The project structuring and procurement process for the Metro Line 2 Concession Agreement was carried out by Proinversion, the specialized national agency in charge of promoting private investment in Peru.** The selection process for Metro Line 2 was carried out in two steps, a pre-qualification stage and a bidding stage (including the final technical and financial bid), and resulted in the award of the contract on March 28, 2014 to the consortium, "Nuevo Metro de Lima". The Concession Agreement was signed between MTC and the consortium on April 28, 2014 and put in the public domain shortly thereafter by Proinversion.[23]

[23] http://www.proyectosapp.pe/RepositorioAPS/0/2/JER/LINEA2_TREN/CONTRATO_Y_ANEXOS_SIN_PT_Y_EIA.zip

38. **The Bank conducted a thorough review of the selection process for the Concession Agreement to determine if the process would be acceptable to the Bank in accordance with Section 3.14(a) of the "Procurement Guidelines"[24] on Public-Private Partnership arrangements.** This review comprised the analysis of the conditions of the selection process in particular with regard to the following elements: (i) eligibility of the consortium and its members; (ii) reference to Bank fraud and anti-corruption policy[25]; (iii) transparency; (iv) conditions for open competition; (v) qualification criteria; (vi) fairness; and (vii) grievance mechanisms. The review showed that Proinversion had followed the principles of Bank procurement policy (including eligibility, fraud and anti-corruption) and that the process had been carried out in a competitive, transparent and fair manner, although a few aspects did not necessarily follow standard best practices.[26] The Bank's review confirmed that the selection of the concessionaire was done in accordance with the applicable Bank procurement policy.

39. **The Bank will continue to be engaged in the supervision and monitoring of the Concession Agreement, in cooperation with the other IFIs, including through the joint Operational Manual.** Any substantial change to the contract will be reviewed by the Bank (Appendix 1, Section 3 of the Procurement Guidelines).[27] The Bank and the other IFIs will establish procedures to coordinate their action to ensure that all parties are properly informed of any modification to the contract and any potential action to exercise their respective fiduciary functions.

E. Social (including Safeguards)

40. **The proposed Project would deliver important social benefits in the long term.** The Metro Line 2 Project, as part of an larger integrated metropolitan system, will significantly improve mobility options in the LMR, particularly for the lower income segments of the population that rely on public transport for access to jobs and services. As such, the Project is likely to generate tangible benefits for socially excluded groups, including female-headed households, people with disabilities, the unemployed youth and other vulnerable groups. The needs are greater in peripheral locations, where residents are often excluded from the city's economic, social, and cultural opportunities. The Project is following Peruvian requirements for public consultations[28] consistent with World Bank policies.

[24] "Procurement Guidelines" means the "Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loand and IDA Credits and Grants by World Bank Borrowers" dated January 2011 (revised July 2014).
[25] Candidates had to sign an affidavit (form 13 of Annex No.3 of the bidding documents) which described Bank provisions on fraud and corruption, its related sanctions, and their obligation to give access to Bank auditors of their records and documents relating to the preparation and execution of the contract.
[26] These aspects include the use of a dynamic qualification process (updating the qualification requirements during the initial pre-bid phase), a quite short period of time for final bid submission, and an excessive amount for surety in the case of filing a complaint.
[27] This includes cases of (i) a material extension of the stipulated time for performance of the contract; (ii) any substantial modification of the scope or of the terms and conditions of the contract, including change in membership of the consortium and/or of its suppliers; (iii) any variation order or amendment, which singly or combined, increase the original amount by more than 15%; or (iv) the proposed termination of the contract.
[28] Public consultations on the semi-detailed EIA and RPF have followed Peruvian regulations, including *Resolución Directoral Nº 007-2004-MTC-16*, and occurred through at least 5 public events in the LMR from March-May 2013.

41. **The proposed Project is expected to be enhanced by citizen engagement and local participatory planning activities.** The Concessionaire has started a study through a specialized consulting firm hired to develop a detailed stakeholder analysis for the Project and an Integrated Social Management System (ISMS) consisting of 6 programs: (i) grievance redress mechanisms; (ii) local employment; (iii) public information and communications; (iv) social monitoring and management of social impacts; (v) institutional and environmental alignment; (vi) environmental and traffic education. The ISMS is consistent with international best practices but will require oversight from MTC-DGASA, OSITRAN, and AATE. The grievance redress mechanisms during Metro construction are the responsibility of the Concessionaire with support and oversight by AATE and other project-related agencies.

42. **Per the Concession Agreement, stations will be constructed according to international standards of universal accessibility (elevators, escalators, and signage)** Beyond a minimum level of pedestrian facilities and bicycle parking in the concession area, it is the responsibility of the local districts to provide access to the stations and the Bank is working with the Municipality of Lima to implement a design methodology that also ensures engagement with vulnerable groups including persons with disabilities.[29]

43. **Land acquisition for the proposed Project will cause economic and physical displacement.** The 35-km mostly underground alignment will only require land acquisition in the areas needed to build stations and ventilation shafts. According to estimates based on preliminary designs, Line 2 will affect 338 lots and Line 4 Branch will affect 38 lots, for a total of 376 lots. Of these, 279 are privately owned and 98 belong to public entities. AATE also developed land acquisition and resettlement experience during the construction of Lima Metro Line 1.

44. **A Resettlement Policy Framework (RPF) called the PACRI (*Plan de Compensación y Reasentamiento Involuntario*) was prepared and disclosed as part of the Environmental Impact Assessment (EIA) for the Project.** The RPF was reviewed by the World Bank and is in accordance with relevant safeguard policies. The RPF was published as part of the EIA by Government on or before April 28, 2014 and on the World Bank's external website on October 22, 2014. A supplemental Environmental Impact Assessment (EIA) was developed with the support of the IADB and World Bank and disclosed on the World Bank's external website and by Government in March 2015.[30] Detailed resettlement action plans consistent with the RPF are being developed and implemented by AATE in phases as project designs are finalized.

45. **A detailed Resettlement Action Plan (RAP) for Phase 1A was prepared and disclosed.**[31] Consultations were undertaken during the preparation of the RPF and with the affected people during the preparation of the RAP for Phase 1A. Detailed designs are currently only available for Phase 1A affecting 41 properties, of which 21 are owned by public entities (gratuitous transfer) and 20 are privately owned. Land acquisition for the other sections will begin

[29] The World Bank is currently supporting a pilot project with the Municipality of Lima for the mainstreaming of inclusive design and universal mobility on the *Metropolitano* BRT through a PHRD Grant (P129561).
[30] Details including dates and web links to all relevant and disclosed safeguards instruments are found in Annex 4.
[31] The detailed RAP for Phase 1A was published by the Bank's Infoshop on February 11, 2015 and by Government on March 31, 2015. The designs for Phase 1B are ongoing and the detailed RAP for Phase 1B is not expected to be available before June 2015.

once the detailed designs become available. As detailed in Annex 4, land acquisition and resettlement for Phase 1A was completed in May 2015 and all compensation payments have been made. The RAP includes the land acquisition to date and displacement of informal businesses. The resolution of any disputes with affected persons will meet the standards set in the RPF.

F. Environment (including Safeguards)

46. **The Project is classified as Environmental Category A as per Bank Operational Policy on Environmental Assessment (OP/BP 4.01) due to the potential impacts associated with large scale construction and the relatively large geographic footprint in an urban environment**. While the Project does not anticipate significant impacts on physical cultural resources based upon the findings of the EIA conducted and supplemental information compiled, the Bank policy OP/BP 4.11 on Physical Cultural Resources is triggered given the potential during construction of encountering cultural and potential archeological sites along the alignment. The Bank policy OP/BP 4.09 is triggered since the project will require the limited use of regularly available pesticides for pest control (e.g., rodents, etc.) in the tunnels during the operation phase. Applicable mitigation and monitoring measures related to both policies are established in the Project environmental management plan and concessionaire environmental requirements.

47. **The project may have long-term positive environmental benefits, in particular related to greenhouse gas emissions (GHGs), air quality and other improvements in the health and quality of life of the residents of Lima.** The Project was estimated to reduce GHG emission from vehicles powered by fossil fuels by 30,000 to 50,000 tons per year of CO2-equivalent under the conservative base demand scenario assumptions. The level of emission reductions and climate change mitigation will be primarily a function of the migration of trips from road-based modes consuming fossil fuels to the more efficient electric Metro and its feeder system. In the same way, the project may also contribute to reductions in the number of accidents and air pollution.

48. **An Environmental and Social Management Plan (ESMP) has been developed as part of the EIA of the Project.**[32] The EIA was developed by a consortium of consultant firms based upon Terms of Reference approved by MTC's Directorate General on Socio-Environmental Matters (DGASA). The EIA and the Project environmental license were issued by DGASA in November 2013. Potential key negative environmental impacts and risks include: increased traffic, noise and vibration during construction and operation, construction worker health safety risks, transport and disposal of soil/excavated material from the tunnel and station excavations, potential increased subsidence or impacts on ground water due to tunneling and excavations, operation phase risks associated with metro accidents/emergencies and waste management at rail car maintenance facilities. The ESMP consists of numerous specific mitigation and monitoring programs, including pest management and physical cultural resources. A supplemental EIA was developed to address requirements from the IFIs (primarily IADB and World Bank) including information on alternatives evaluation, select identified environmental impacts and management measures; and was publically disclosed on November 24, 2014. Evaluation of project alternatives was considered as part of the EIA, supplemental EIA, and also in prior studies such as the Metro Network Plan for Greater Lima and Callao and the Metro Line 2 Feasibility Study, and included alternative alignments and construction methods.

[32] A complete description of environment management programs is included in Annex 4 of the PAD.

49. **Various public consultation meetings/events took place in August and September 2013 associated with the EIA finalization.** The draft EIA was publically disclosed and an information center was opened to provide information and respond to stakeholders. Stakeholder input was also received as part of the development of the Metro Network Plan for Greater Lima and Callao and the Metro Line 2 Feasibility Study. Additional stakeholder engagement will be performed during project construction and operation.

50. **Responsibilities for project's environmental management are with the Government and the Concessionaire.** AATE is the responsible governmental entity under the Project loan for environment and social matters, including project supervision and coordinating environmental management of works to clear infrastructure interferences along the alignment and traffic management during construction. OSITRAN is responsible for supervision of environmental health and safety aspects under the Concession Agreement, and has hired an international firm to support project supervision including environmental health and safety aspects. DGASA was responsible for review and approval of the Project EIA (issuance of environmental permit) and for subsequent supervision of the project environmental permit. The Ministry of Culture is responsible for approving activities involving archeological resources and associated permitting if required. The concessionaire is responsible for Project construction and operation and maintenance environmental health and safety requirements as established under the concession contact. Initial institutional strengthening and coordination activities for AATE and OSITRAN have been developed by the Bank and all such measures and others associated with the Project's environmental management will be included in the Project Operational Manual.

51. **The Concession Agreement has extensive environmental, health and safety (EHS) requirements.** These include compliance with all applicable Peruvian regulatory requirements, Project EIA (and ESMP) and environmental permit issued by DGASA, development and implementation of EHS Management Systems, EHS performance reports on a routine basis, specific EHS requirements to address final design in each EDI, providing EHS training to workers, obtaining any required archeological or cultural resource permits and implement measures to mitigate project impacts on such resources as required by law, and maintaining insurance in relation to project EHS risks. In particular, the Concession Agreement has a specific clause requiring the concessionaire to comply with all IFIs environmental and social requirements established for the Project, which includes the relevant ESMP and EHS aspects identified in the supplemental EIA. The Concessionaire is already undertaking this as part of their overall EHS Management System development (e.g., plan enhancements). In addition, at the request of the Bank and IADB, AATE has submitted the supplemental EIA to DGASA for review and consideration as a formal part of the project environmental permit (e.g., amendment to the permit). The Bank and other IFIs have established requirements for the entire Lima Metro Line 2 Project, including related institutional capacity aspects and supervision.

G. Grievance Redress

52. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected

communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit www.worldbank.org/grs. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1: Results Framework and Monitoring

Country: Peru

Project Name: Lima Metro Line 2 Project (P145610)

Project Development Objectives

PDO Statement

The PDO is to provide a major east-west axis (Ate-Lima-Callao) of the Lima-Callao Metropolitan Region with a modern and integrated mass transit system that will improve accessibility to jobs and services in the area of influence of the Lima Metro Line 2 and the Gambetta Branch of Line 4.

These results are at | Project Level

Project Development Objective Indicators

	Indicator	Unit	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology	Responsibility for Data Collection
				2016	2017	2018	2019	End Target			
1	**Mobility**. Change in travel time for public transport users for the following origin-destination pairs[33]: • Ate - Callao • La Victoria - Av. Argentina • Centro - Aeropuerto • Breña – Sta. Anita • Univ. San Marcos - Ate	Total travel time in minutes including transfer and access time in area of influence of Metro Line 2.	120 55 60 65 90	--	--	--	--	45 20 20 27 33	Annual	Transport model and field surveys	AATE

[33] Baseline values consider current travel times with existing public transport in selected Origin-Destination pairs according to the Government-approved Feasibility Study for Metro Line 2. The end targets indicate travel time after Project implementation and based on field surveys to be conducted after the start of operations for the relevant segments.

	Indicator	Unit	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology	Responsibility for Data Collection
				2016	2017	2018	2019	End Target			
2	**Accessibility.** Increase in number of jobs reachable by public transportation within a 60 minute one-way commute in the area of influence of Metro Line 2. [34]	Weighted number of jobs (adjusted for demographic changes)	--	--	--	--	--	100,000	Annual	World Bank Accessibility model and follow-up study	AATE
3	**Ridership.** Passengers traveling per day on Metro Line 2, differentiated by income level, gender and other user characteristics.[35]	Average passengers per day on segment of Line 2 in operation	--	--	--	50,000	150,000	360,000	Annual	Passenger counts after at least one year of operations	AATE
4	**Integration.** Number of major Metro Line 2 stations with physical integration and fare system interoperability to facilitate transfers.[36]	Number of transfer stations	--	--	--	--	--	2	Annual	Integration and Accessibility Plan; Implementation site visits	AATE
5	**Engagement/Acceptability.** (i) Number of citizens engaged in accessibility design activities. (ii) Percentage of Metro Line 2 users satisfied with services, differentiated by income level, gender and other user characteristics.	--	--	--	--	100 --	200 >60%	>200 >75%	Annual	Participatory Planning/ Placemaking Activities User Surveys	AATE

[34] An accessibility model (described in Annex 7) has been developed by the World Bank integrating census data with the transport network to calculate these figures with the implementation of the project.

[35] Intermediate ridership values in years 2018 and 2019 correspond to an initial estimated demand for Phase 1A and Phase 1B in full operation, respectively.

[36] These measures will be detailed in an integration and accessibility plan for Line 2. Major transfer stations with physical integration are expected to include at least 28 de Julio (with Metro Line 1) and Estación Central (with Metropolitano BRT), but others may be implemented in collaboration with the Municipalities. Physical integration should minimize distances and impediments for transferring users. Fare system integration is technological interoperability between the cards used on Line 1, Line 2 and Metropolitano BRT.

Intermediate Results Indicators

	Indicator Name	Unit of Measure	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology	Responsibility for Data Collection
				2016	2017	2018	2019	End Target			
1	**Stations**. Number of stations completed, including all equipment and urban integration elements according to the Concession Contract.	Number	0	0	5	11	19	35	Annual	Progress Reports	AATE/ OSITRAN
2	**Rail Infrastructure**. Progress in the construction of the tunnel, including track superstructure, signaling and telecom equipment, and catenary.	Kilometers	0	0	5	11	19	35	Annual	Progress Reports	AATE/ OSITRAN
3	**Depots**. Progress in the construction of the depots for Line 2, including track, electrification, signaling and telecom, and all maintenance and personnel facilities.	Depots	0	0	0	0	1	2	Annual	Progress Reports	AATE/ OSITRAN
4	**Rolling Stock**. Train vehicles tested and approved for operations with signaling and control system.[37]	Rail cars	0	0	30	90	132	252	Annual	Progress Reports	AATE/ OSITRAN

[37] Phase 1A to operate using GoA2 level signaling and control, while Phases 1B and 2 to operate using GoA4.

Annex 2: Detailed Project Description

PERU: Lima Metro Line 2 Project

1. **The Lima Metro Line 2 Project (the Project) will be implemented under a single Concession Agreement corresponding to the Design-Finance-Build-Operate-Transfer (DFBOT) modality**. The concession encompasses the design, financing, construction of civil works, provision of rolling stock, and operation and maintenance of the new infrastructure over a period of 35 years. This is known as a fully-bundled vertically integrated Public-Private Partnership (PPP).

2. **With an estimated cost of approximately of US$5.836 billion, the Project is one of the largest single infrastructure contract ever awarded in Peru.** The Project encompasses the full 27.3 Km of the proposed Line 2 (East-West axis connecting the district of Ate with the municipality of Callao, including physical connections with the existing Metro Line 1 and the Bus Rapid Transit (BRT) system (*Metropolitano*), and a 7.7 Km stretch of the proposed Line 4 (connecting Line 2 with the international airport and vicinity). The Project will have a total of 35 stations along 13 adjacent or near adjacent districts in the Metropolitan Area of Lima and Callao (9 in Lima and 4 in Callao): Ate Vitarte, Santa Anita, San Luis, El Agustino, La Victoria, Breña, Jesús María, Cercado de Lima, San Miguel, La Perla, Bellavista, Carmen de la Legua, Cercado del Callao. The future stations of Line 2 and the Line 4 branch will not be located in the districts of Jesús María, La Perla, and San Miguel but will be within 500 meters of their boundaries. For this reason, the 13 districts are considered the direct area of influence of the Project.

A. The Concession Agreement

3. **As per Peruvian regulations, the contract constitutes a PPP in the form of a "Co-financed Concession",** defined as a PPP in which the Government makes a capital contribution towards an economically viable project in order to make it financially viable. On behalf of the Government of Peru (GoP), the National Investment Promotion Agency (ProInversion) structured the PPP with the support of external advisors.

4. **On March 28, 2014 the GoP awarded a Concession Contract for the development of an underground metro rail line Project to the consortium Nuevo Metro de Lima, the only consortium that submitted a bid.** This Consortium bid the lowest public sector contribution (investment co-financing+ annual O&M payment, weighted by the following factors: 74 percent for co-financing and 26 percent for annual O&M payment). These factors were determined by weighting each component of the remuneration by the total, using the maximum payments estimated by the Government. The Concession Contract was executed on April 28, 2014.

5. **Under the Fully-Bundled Concession scheme, the concessionaire's remuneration is not based on work quantities but on the availability of the contracted infrastructure and the provision of services of a minimum standard.** In this sense, the Contract has a "Unitary" nature regardless of the different types of services provided by the Concessionaire: construction, maintenance, operation and maintenance. Nonetheless, the responsibility for honoring contractual commitments remains exclusively with the Concessionaire. Section D below explains in detail the different payments to the Concessionaire.

6. **The Concessionaire can provide ancillary services within the area of the Concession at market prices with previous authorization and with gross revenues to be split with the Granting Authority in predefined shares.** The Concessionaire can: (i) Lease commercial spaces with equal sharing of gross revenues with the Granting Authority; (ii) Lease advertising space in rolling stock, fare cards and infrastructure with equal sharing of gross revenues with the Granting Authority; (iii) Lease concession spaces for TV and radio advertisements with equal sharing of gross revenues with the Granting Authority; O&M services for other transport operators with 80 percent of gross revenues for the Concessionaire and the remaining 20 percent for the Granting Authority; and (iv) Right of way services with equal sharing of gross revenues with the Granting Authority. Other ancillary services require prior approval from the Conceding Power. The Concessionaire can also propose Optional Services to be approved by the Conceding Power and with gross revenue sharing to be mutually agreed.

7. **The Concessionaire assumes design, financing construction and operational performance risks, while the GoP mainly assumes risks related to demand, unknown geological conditions, expropriation and unknown interference with utility networks.** Under the terms of the Concession, the Concessionaire is responsible for construction costs and time overruns that fall under its responsibility (input costs, availability of material and equipment, design problems) while the GoP is responsible for delays and additional costs that result from its failure to deliver the right of way as scheduled, unknown interferences with public utility networks and the occurrence of geological events specifically defined in the Concession Agreement and unknown at the time the Contract was executed. Archeological chance finds that interrupt works / operations, as well as failure to obtain the required licenses to develop the Project, if such failure is not the responsibility of the Concessionaire, lead to a suspension of the Concessionaire's obligations under the Contract. The GoP does not provide a minimum tariff revenue guarantee, but has committed to make up for the difference between the required payments to the Concessionaire and actual revenue collection during the operational period. In this sense, the GoP is assuming the risk that ridership falls below original estimates.

8. **The Concessionaire is required to post performance bonds (in the form of letters of credit) to guarantee the performance of its obligations under the Contract.** All performance bonds must be issued by first rate financial institutions. Specifically, the Concessionaire is required to post various performance guarantees: (i) guarantee of the performance of obligations under the Concession Agreement: US$280 million until start of investment and at least US$70 million or 50 percent of the annual payment for O&M thereafter; (ii) guarantee for the construction works performed: starting at US$470 million, decreasing gradually, but no less than US$170 million during the construction period; and (iii) a guarantee to cover the rolling stock investment obligations of US$50 million.

9. **The Concessionaire has the obligation to revert the assets under the Concession to the Granting Authority at the end of the Contract term.** Nonetheless, considering that part of the Project corresponds to Line 4 (Av. Faucett and Av. Gambetta segment) and that the GoP intends to complete this line in its entirety in the future through PPP or other procurement arrangements, the Granting Authority reserves its right to request the reversion of the assets related to this section (civil works and rolling stock) at any moment in time by following the procedure set for this

purpose in the Concession Agreement. Following this, the Concessionaire will give up its right to collect tariff revenues and receive the RPMO payment associated with this segment.

10. **The other main features of the Concession Agreement are further described below:**

- Under this fully-bundled PPP scheme, the Concessionaire is responsible for all services: design, construction, operation and maintenance. In order to accomplish the objective of the contract, the Concessionaire will enter into an Engineering, Procurement and Construction (EPC) Contract with a Consortium made up by the same firms that are shareholders of the Concessionaire: Dragados (Spain), FCC (Spain), Salini Impregilo (Italy), Ansaldo STS (Italy) and Cosapi (Peru). Ansaldo Breda (Italy) will be the rolling stock provider. In addition, the Concessionaire will also enter into an agreement for operational advice with Metro de Madrid (Spain). These companies have the experience and track record required for the implementation of the Project (see Procurement section below).
- The Concessionaire assumes the design, financing, construction, and operational performance risks, while the GoP mainly assumes risks related to demand (fare revenues), unknown geological conditions, chance finds, land acquisition/resettlement, and unknown interference with utility networks.
- The Granting Authority (MTC) makes payments during construction against the completion of predefined construction and rolling stock delivery milestones (payments are known as Payment for Works and Payments for Rolling Stock— or PPO and PPMR, respectively, for their initials in Spanish). The Granting Authority also remunerates the Private Concessionaire for the investments under its responsibility through the issuance of irrevocable certificates provided at the completion of capital investment (construction and rolling stock) milestones and that give the Concessionaire the right to unconditionally receive a stream of payments over a period of 15 years (certificates for works milestones known as RPI-CAOs, *Retribución por Inversiones – Certificado de Avances de Obras*). There are 51 civil works construction milestones and 3 rolling stock milestones remunerated through the PPO, PPMR or RPI-CAO mechanisms. In addition, there are annual payments for operation and maintenance (known as RPMO) to compensate the Concessionaire for fixed operation and maintenance costs, variable energy costs, variable rolling stock maintenance costs, general expenses and a profit margin over these activities. Variable costs depend on the train-km operated. Annex 2 (Section D) includes a full description of the forms of the GoP payments to the Concessionaire.
- OSITRAN is the independent regulatory agency supervising the design and construction of the Project with the support of a team of specialized engineers/consultants. OSITRAN, through UNOPS, competitively procured and awarded in May 2015 a US$100 million international supervision contract for this purpose. Concession Contract includes dispute resolution mechanisms, including international arbitration, as described further below.
- The Concessionaire can also provide ancillary services (retail and advertisement) within the area of the Concession at market prices with the previous authorization and with gross revenues to be split with the Granting Authority at predetermined rates.
- The Concessionaire was required to post performance bonds provided by first rate financial institutions to guarantee the performance of its obligations under the Contract.

- The Concessionaire has the obligation to revert the assets under the Concession to the Granting Authority at the end of the Contract term, except for the Line 4 segment, which has to be reverted at request of the GoP at any moment following the start of operations.

B. Project Stakeholders

11. In coordination with the MTC and with the support of external consultants, ProInversion (the Project Structuring Agency) defined the Project's concept and designed and implemented the bidding process. The Ministry of Transport and Communications (MTC) (the Concession Granting Authority and Public Partner under the PPP agreement) is in charge of managing the implementation of the Project following its award by Proinversion, through the Autonomous Authority of the Electric Mass Transit System of Lima and Callao (AATE) (the Implementing Agency). Finally, supported by external and international consultants, the Independent Transport Sector Regulation Agency (OSITRAN) (the Contract Regulator and Supervisor) will be in charge of the regulation of the contract and supervision of the Project.

12. The Project will be executed by Metro de Lima Línea 2 S.A., a special purpose vehicle (the Concessionaire) set up by the winning consortium and including the following shareholders: Iridium/ACS Group of Spain (25 percent); FCC of Spain (18.25 percent); Salini Impregilo of Italy (18.25 percent); Ansaldo STS of Italy (16.90 percent); Ansaldo Breda of Italy (11.60 percent); and COSAPI of Peru (10 percent). Ansaldo STS and Ansaldo Breda are part of Italian Industrial Conglomerate Finmecannica SPA (rated BB+ by Fitch)

13. In order to accomplish the objective of the contract, the Concessionaire will enter into an Engineering, Procurement and Construction (EPC) Contract with a Consortium made up by the same firms that are shareholders of the Concessionaire: Dragados (Spain), FCC (Spain), Salini Impregilo (Italy), Ansaldo STS (Italy), Ansaldo Breda (Italy) and Cosapi (Peru). In addition, the Concessionaire will also enter into an agreement for operational advice with Metro de Madrid (Spain).

Table 1: Concessionaire's Shareholders and EPC and Operations Contractors

Company (Country)	% Participation in the Concessionaire	% Participation in EPC Consortium	Role	Track Record and Experience
Iridium Concesiones de Infraestructura (Spain)	25%	0%	Strategic Partner	Part of the ACS Group (unrated), world leader in the construction and operation of infrastructure. The Company manages more than 90 infrastructure concessions, including 9 rail concessions: -Ottawa Light Rail (Canada); -TP Ferro Rail Infrastructure (France and Spain); - Poceirao-Caia High Speed Rail (Portugal); -Barcelona Metro Line 9 and Arganda Metro (Spain).

Dragados (Spain)	None	25%	Construction	Part of the ACS Group (unrated), Dragados is one of the main companies in this group. The company has built 1,388 km of tunnels (239 km for roads, 225 for railways 240 km for metros, 555 km for water projects and 129 km for mining projects) around the world. Relevant projects built by Dragados include: -Madrid Subway 1995-2013 (Spain) -East Side Access - New York City (USA) -High Speed tunnels (Spain) -M-30 Bypass (Spain)
FCC (Spain)	18.25% (Through *Vialia Sociedad Gestora de Concesiones e Infraestructura*)	19.00%	Construction	Relevant experience includes the Company's participation in the construction of the following projects: -Singapore Metro; -New Delhi Metro; - Barcelona Metro: Lines 2,5 and 9; -Madrid Metro: Line 2 & Metro Sur; -Lisbon Metro: Alameda-Expo section; -Athens Metro; -Line 1 of the Panama City Metro; -High speed between Madrid and Barcelona, Seville and Valladolid; -Tunnels in Spain, Germany, Portugal, Switzerland, Austria and Mexico.
Salini Impregilo (Italy)	18.25%	19.00%	Construction	Global industrial group specializing in the construction of large and complex projects, operating in over 50 countries and more than 34,000 employees. The Company has built more than 6,700 km of railway lines, approximately 340 km of metro lines and more than 1,250 km of underground works. Projects include: -New high speed Ankara-Istanbul line in Turkey; - Milan-Genoa line in Italy; - Sydney North West Rail Link in Australia; -Metro projects in Thessaloniki in Greece, San Francisco in the US, Copenhagen in Denmark, Santiago in Chile, Doha in Qatar and Riyadh in Saudi Arabia.
COSAPI (Peru)	10.00%	10.00%	Construction	Engineering and construction company currently working in Peru, Chile, Venezuela, Dominican Republic and Colombia

Ansaldo Breda (Italy)	11.60%	12.00%	Rolling Stock	AnsaldoBreda, part of the Finmeccanica Group (rated BB+ by Fitch), is one of the world's leading suppliers of passenger trains for intercity, regional/commuter, and transit/metro applications with vertically integrated capabilities in car bodies, trucks/bogies (wheel sets) and propulsion systems. With current fleets operating in Washington DC, Atlanta, Boston, Cleveland, Los Angeles and San Francisco; AnsaldoBreda is one of the largest suppliers of transit rail cars in the United States. Other projects include: -Goteborg Light Rail Vehicle; - Miami Dade Country Metro; -Fortaleza Rail Project; - Milan Metro (lines 1 and 2); -Metro Madrid (serie 7000-9000).
Ansaldo STS (Italy)	16.90%	15.00%	Equipment and Systems	Ansaldo STS, part of the Finmeccanica Group (rated BB+ by Fitch), operates in the signaling and integrated transport systems markets for both passengers (railway/mass transit) and Freight. The company designs and implements signaling systems and components for railway and underground traffic management and control. The company has experience in the following projects: -Automated metro systems in Copenhagen, Brescia, Thessaloniki, Honolulu, Milano Line5; Naples Line 1 and Rome A/B/C metro lines -Metropolitan light railways in Genoa and Naples Line 6; -Tramway in Florence; -Part of the electro-rail installations for Milan's metro line 1; -Production, installation, testing and commissioning of signaling, telecommunications and electrification for 330km of the two-track line between Ipoh and Padang Besar, Malaysia.
Metro de Madrid (Spain)	None	None	Operations Advisor	Operates 324-km of Madrid's 12 subway lines and 1 light metro line with more than 600 million passengers/year- second largest metro network in Europe and the eighth in the world. Metro de Madrid provides consultancy services in 15 countries in Europe, East Asia and Middle East, Latin America and North Africa and is also a member of the Benchmarking Community of Metros (COMET) and other global metro organizations.

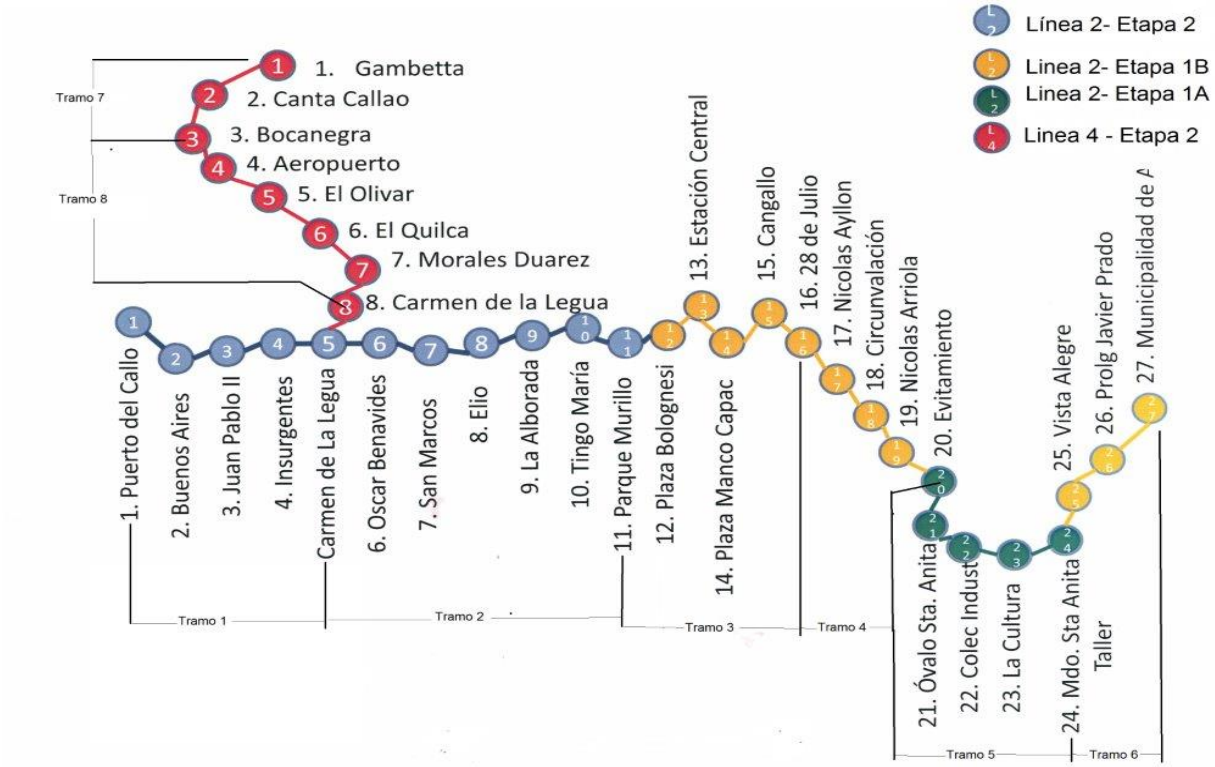
C. *Detailed Project Description and Implementation Phases*

a. *Construction*

14. **The Project will be developed in three distinct phases that together make up the Execution Phase.** The First Phase, including the construction of segments 1A and 1B (which together make up segment 1), is expected to enter in operations approximately 4 years after the start of construction. The Second Phase, including the construction of segments 2 and 3, is expected to become operational 6 years after the start of construction. The Third Phase, consisting of the acquisition and deployment of additional trains should remand reach a given threshold.

15. **Final designs for Metro Line 2 by the Concessionaire are underway.** The initial segment, Phase 1A, will include about 4.9 km of line, 5 stations, a rail yard and test tracks in the area of the future Santa Anita station. The start of construction for Phase 1A is imminent and depends on the Concessionaire reaching financial close and the GoP providing the necessary land for implementation and resolution of interferences with utilities in Phase 1A. Land acquisition and expropriation led by AATE are ongoing for Phase 1A and are fairly advanced. The Project's schedule estimates completion of Phase 1A within two years of the start of construction and the completion of the remaining 30km in approximately five years from the start of construction. A detailed description of the Project is provided below. Civil works, set to begin in the first semester of 2015, are not expected to be concluded before 2020 and will be developed in three different construction stages as illustrated in Figure 1 below:

Figure 1: Construction Phases



Phase 1A consists of the construction of 4.9 km of tunnel and five stations: Evitamiento, Óvalo Santa Anita, Colectora Industrial, La Cultura, and Mercado Santa Anita (this last station will have a connection to a train yard). Phase 1A is expected to be operational in year 2016/2017 as it requires at least two years from the start of construction. This segment includes a rail yard and test tracks at Santa Anita station. The required land acquisition for this is ongoing and fairly advanced.

Phase 1B consists of three different tunnel sections that together add approximately 11km of line. It will include eleven stations: Plaza Bolognesi, Estación Central (integration with future Line 3 and Metropolitano BRT), Plaza Manco Capac, Cangallo, 28 de Julio (integration with Line 1), Nicolas Ayllon, Circunvalación, Nicolas Arriola, Vista Alegre, Prolongación Javier Prado, Municipalidad de Ate. Phase 1B is expected to be completed within 3 to 4 years of the start of construction (year 2018 in the estimated schedule).

Phase 2A and 2B consists of the remaining sections of Line 2 (approximately 9.9km of tunnel) and a branch of Line 4 branch of approximately 7.7km. These sections will include a total of nineteen stations: Puerto del Callao, Buenos Aires, Juan Pablo II, Insurgentes, Carmen de la Legua, Oscar Benavides, San Marcos, Elio, La Alborada, Tingo María, Parque Murillo (these eleven in Line 2), and Gambetta, Canta Callao, Bocanegra, Aeropuerto, El Olivar, El Quilca, Moralez Duarez, Carmen de la Legua (these eight in the Line 4 branch). Phase 2 is expected to be completed in about 5 years from the start of construction (year 2020 in the estimated schedule).

b. Rolling Stock, Signaling and Systems

16. **The Project also includes provision of the rolling stock, systems and other equipment needed to operate the 35km alignment.** The Concession contract specifies the rolling stock to be train sets of six cars each with a total capacity of 1,200 passengers per train (assuming 6 passengers per square meter). As detailed in Annex 3, the Concessionaire is responsible for preparing detailed engineering designs both for civil works and rolling stock according to Project's Definitive Engineering Studies (EDIs). The Rolling Stock EDI brings all technical specifications of trains to be acquired and used for the Lima Metro Line 2.[38] According to the Concession Agreement (Clause 6.24) the Rolling Stock to be made available should follow the sequence below:

a) Phase 1A: no later than 24 months after financial closure, a total of 5 trains with six cars each.
b) For Phases 1A and 1B: no later than 40 months financial close, a total of 20 trains with six cars each.
c) For Phases 1 and 2: no later than 58 months after financial close, a total of 35 trains for both Metro Line 2 and Metro Line 4 Branch with six cars each.
d) For Phase 3: additional trains of 6 cars each will be acquired and incorporated according to the growth in demand throughout the concession period.

[38] Detailed technical description in Appendix 3 of Annex 7 of the Concession Contract.

17. Concerning Systems and Signaling, the Concessionaire will be responsible for the design and operation of the Project's power systems. Electric power produced in substations will be transferred to the trains through catenaries (flexible catenaries for sections outside tunnels and rigid catenaries for sections in tunnels and inside rolling stock maintenance installations). The Concessionaire will also be responsible for managing the Automatic Train Control system (ATC) and Automatic Train Operation system (ATO) to optimize traffic, ensure safety and reliability, and save energy. System functions will be completely automated through a Communications Based Train Control (CBTC) that will ensure driverless operation (capable of GoA4 automation) with headway limit of 80 seconds, commercial speed not inferior to 36 Km/h, and a stoppage time of 20 seconds.

D. Government Payments to the Concessionaire

18. Payments to the Concessionaire will consist of the following: (1) Government co-financing of investments in civil works, equipment and rolling stock; (2) deferred payments to remunerate concessionaire for its investments in civil works, equipment and rolling stock (*Retribución por Inversión – RPI*); and (3) Government payments for operation and maintenance expenditures (*Retribución por Operación y Mantenimiento –RPMO*). All payments will be channeled through a Trust (*Fideicomiso*) created for the purpose of administering public and private capital contributions into the Project.

19. **Government Co-financing:** during the first phase, the Government will make payments against progress in the delivery of construction works and purchase of rolling stock in accordance with the schedule established in the EFR and EDIs. Government's total co-financing of the Project, per the winning bid, will be US$3.695 Billion for the investment (4.38 percent less than the maximum permitted in the bidding requirements). Works and rolling stock will be delivered in milestones (*Hitos de Obra*). The completion and certification of these milestones gives rise to a payment obligation on the part of the Government.

i. First Phase: during the First Phase (over a period of 44 months), the Government will make two types of quarterly payments (paid in arrears and in USD):
   - Payment for Works (*Pago por Obras-PPO*): Payment milestones correspond to Work Advances (*Avances de Obra*) for which the Concessionaire presents a report each quarter and that have to be certified by the Government in order to generate a payment obligation. Multiple Work Advances make up a single Milestone (*Hito de Obra*). Payments can be subject to adjustments made at the delivery of each milestone:
     - *Deductions* reflecting government observations to the works delivered that are not addressed by the Concessionaire.
     - *Increases* in consideration of additional costs arising from expropriation, geological events and other interferences.
   - Payment for the Rolling Stock to be acquired in the First Phase of the Project (*Pago por Material Rodante de la Primera Etapa-PPMR*): Payment milestones will correspond to purchase orders that can be of up to 40 percent of the total budget for rolling stock acquisition. The Government may retain

up to 30 percent of the total payment subject to the adequate functioning of the rolling stock for the First Phase.

ii. **Government Payments to Remunerate Concessionaire investments**: during the second phase, investments in civil works and rolling stock will be undertaken by the concessionaire. The Government will compensate the Concessionaire for the investments made through a mechanism known as Reimbursement for Investment (*Sistema de Retribución por Inversiones* –RPI). RPI payments are irrevocable irrespective of the completion of the entire project. Two types of payments (both in USD, payable in 60 installments over a period of 15 years) originate under the RPI:

- RPI-Works (RPI): Payment follows from the certified completion of a proportion of works completed in a three month period (*Avance de Obra*) as a percentage of the reference investment budget for each milestone (established in the EFR and relevant EDI).
- RPI-Rolling Stock (RPI-MR): Paid in accordance to the budget and delivery times established in the EFR and EDI for rolling stock as per a schedule established in the Concession Agreement.

iii. Third Phase: in the event the Project moves to the third phase, the Concessionaire will make additional investments that will be remunerated through the mechanism that the Granting Authority considers to be the most advantageous at that time among the RPI-MR, the PPMR or a combination of the two.

20. **Government Payments for OPEX:** the RPMO payment is intended to compensate the Concessionaire for fixed operation and maintenance costs, variable energy costs, variable rolling stock maintenance costs, general expenses and a profit margin over these activities. Variable costs depend on the train-Km operated. The RPMO payment offered by the winning bidder of US$108.9 million annually for operations and maintenance was 18.71 percent less than the maximum set in the bidding process.

- The Concessionaire will receive these monthly payments following the start of Project operations.
- RPMO payments can be reduced as a result of penalties imposed for failure to reach the minimum level of service (minimum quality indicators that the Concessionaire must comply with during the Exploitation phase and established in Annex 7 to the Concession Contract).
- This payment is divided in two tranches, corresponding to the two metro lines included in the Project:
  - Compensation for the Ate-Callao tranche- Line 2 (RPMOA-C), which the Concessionaire offered for US$105.9 million per year.
  - Compensation for Av. Faucett – Av. Gambetta tranche-Line 4 segment (RPMOF-G), which the Concessionaire offered for US$2.97 million per year.

E. Financing Arrangements for the PPP

21. **The GoP intends to finance its contribution towards the PPP from budgetary resources and loans provided by International Financial Institutions (IFIs).** These funds will

finance the works to be executed and rolling stock to be purchased during the first phase of the Project – Stages 1A and 1B (co-financing). The Concessionaire will fund the works and rolling stock purchases to be executed during the Second Phase (Stage 2); and may be to required additional rolling stock in a Third Phase, contingent on the demand reaching a level requiring the deployment of more trains.

22. **The Project financing is expected to be backed by irrevocable government payment obligations arising from the certification of investments made by the concessionaire.** The underlying assets of the proposed private financing are the payments owed by the Government to the Concessionaire for the reimbursement of investments related to construction and equipment provision. Once a milestone of investment has been reached and certified, the Granting Authority will issue deferred payment certificates known as RPI-CAOs (*Retribución por Inversiones – Certificado de Avances de Obras*) to the Concessionaire as compensation. Each certificate conveys the right to receive a stream of 60 quarterly payments for a period RPI-CAOs are unconditional and irrevocable contractual payment obligations of the Granting Authority. The Concessionaire can sell its RPI-CAOs to a bankruptcy-remote special purpose vehicle (SPV) that simultaneously borrows money to purchase RPI-CAOs from the Concessionaire (under a sale and purchase agreement). This structure has proven successful for financing PPP projects in Peru.

23. **Since a Project Finance structure was adopted, the capacity to raise financing does not rest with the Project Sponsors.** Long-term financing will be backed by the deferred payments (RPI-CAO) mechanism. While there have been six other PPP financings in Peru based on RPI-CAO structures, the scale of the financing needed for this project is unprecedented. Nonetheless, the Concessionaire has already mandated a group of banks to provide a revolving credit facility and appointed arrangers for the RPI-CAO financing. In late May 2014, a €1 billion macro credit to the Concessionaire was announced in international media. The group of financing institutions is led by European and American banks – Citi, Morgan Stanley, BBVA, Santander and Société Générale, amongst others. As of June 2015, the Concessionaire was negotiating final financial closure with Citi Bank, who announced a US$1.15 billion transaction in the international capital markets to finance the construction and subsequent operation of the Project with a pricing of 5.875 percent and notes due in 2034.

F. Lessons Learned Reflected in the Project Design and Bank's Complementary Support

24. **The Project design reflects lessons from several operations, including the implementation completions reports for the Lima Urban Transport Project (P035740) and São Paulo Metro Line 4 Project (P051696), and active urban rail operations in Latin America such as the Quito Metro Line One (P144489) and Upgrading and Greening the Rio de Janeiro Urban Rail System (P125630).** Some of the main lessons are summarized below:

a) Project Planning and Design:

- Coordination between the different levels of government and the alignment of interests between jurisdictions are instrumental for planning and implementing a metro project. Therefore, the proposed Project and related technical assistance activities will support a metro transport strategy to develop policies and plans for physical, tariff and operational integration, and increased station accessibility through participatory planning approach.

- Strong coordination among financiers is needed on a complex Project with complementary activities. Therefore, the Bank is developing a single Project Operational Manual with other IFIs co-financing the Project and also intends to develop a "Memorandum of Understanding" or "Principles of Collaboration" agreement similar to one for the Quito Metro Line One.[39]
- The proposed phased financing approach has been successfully used in other World Bank transport projects (namely, Colombia National Urban Transit Project (P117947) and Azerbaijan Highway Project 2 (P094488)) to permit possible complementary financing for the same overall Project in the future.
- Demand forecasts include inherent uncertainty and therefore should be carefully evaluated in the economic and sensitivity analyses. The Bank has done an independent analysis of the Line 2 project's transport models and demand estimates as reflected in Annex 6.

b) Implementation:
- Tunneling and construction of stations are complicated civil works which pose safety risks. Proper design, adequate occupational and community health and safety procedures, strict supervision as well as emergency evacuation are of utmost importance in this kind of project.
- Proper traffic management and engineering during construction are essential to minimize disruptions and inconveniences to neighborhoods, pedestrians, bicycles, public transport, and cars.
- The completion of land acquisition should be done well in advance of issuing service orders to avoid costly delays.

c) Social and Environmental Aspects:
- Environmental and social impacts of the construction must be monitored and supervised carefully, particularly those involving involuntary resettlement and impacts to surrounding communities and buildings. Project management and supervision systems are needed with adequate staffing, consultant support, reporting and issue resolution mechanisms.
- Sound grievance and redress mechanisms are essential to help lower potential concerns and tensions with local communities and those affected by the project, and need to done in a coordinated and effective manner. AATE will lead grievance redress mechanism activities in coordination with the concessionaire and with technical support from the Bank. The Bank's technical assistance will support participatory planning activities for station areas and user feedback mechanisms as Line 2 is implemented.

G. Significant Risks and Mitigation Measures

25. **The Project's overall risk rating is high considering the scale and nature of this complex project.** The substantial and high risks by category are described below:

a. **Project Implementation (construction, costs and performance) and Technical Design.** The Project will involve the construction of 35 km of tunnels (including the length of stations and depots) and 35 stations using mostly tunnel boring machines and cut-and-cover methods. Construction risks are significant with any underground civil works and implementation problems or accidents are not uncommon even in well-managed projects due, for example, to

[39] The collaboration agreement among IFIs being contemplated for Lima would not be used to delegate procurement functions; rather it is intended to be a higher-level agreement on complementary activities.

unforeseen soil conditions or seismic events. Risks from operational accidents will be mitigated by the design of appropriate evacuation systems and contingency plans. The international experience with large transport projects over several decades suggests that significant cost increases, scope changes, and/or schedule delays are likely between preliminary design and final construction. Moreover, because of the size and importance of the project, its costs and performance will be intensely scrutinized by the media and the public. The main mitigation strategies are to support good project management y MTC and AATE with transparency and citizen engagement, and ensure active contract supervision by OSITRAN and its consultants. Cost amendments for the Line 2 Project are subject to strict contractual conditions and a 15 percent cap on cost amendments set by Peruvian law for PPP projects.

b. Stakeholders. MTC, AATE and OSITRAN have key roles in reviewing and approving designs and payment milestones, while other government agencies with local or specialized jurisdiction (municipalities, districts, Ministry of Culture) will also need to review and approve, as applicable per law, matters such as traffic management, permits, seismic mitigation plans, and archeological finds. Project affected people may also be unsatisfied with the level of compensation or mitigation which could impact construction or operations of Line 2. MTC and AATE should actively manage the interface with other agencies, reach the necessary agreements with local governments, and proactively provide information on the project status to those affected. The Concessionaire is doing a detailed stakeholder analysis and the Bank is providing technical assistance on social mitigation measures including citizen engagement, grievance redress mechanisms and public communications strategy.

c. Institutional capacity. Line 2 will be the first significant tunneling works in Lima and one of the first fully-bundled PPP subway lines in the world. AATE and OSITRAN have experience with Metro Line 1 but require staff and/or consultants to expand their capabilities and ensure frequent coordination with the Concessionaire. Important mitigation actions are already underway as OSITRAN has hired an independent supervision firm. The GoP has also committed to an institutional strengthening plan and to negotiating agreements with the agencies required to implement Line 2. AATE and OSITRAN are also receiving technical assistance from consultants with the support of the Bank and partner IFIs, described further in below and in Annex 5.

d. Environment and Social. Resettlement and social impacts associated to the construction of Lima Metro Line 2 represent an important source of risk to the Project. Government (through AATE) must expropriate all project-related areas needed for construction and provide these areas to the Concessionaire for their civil works construction and operation. The GoP's approach is to conduct this process by project phase before issuing the order to start construction so that the concessionaire receives the required land unimpeded to avoid delays, cost increases and change orders. The potential environmental impacts for a project of this type can be significant if not properly mitigated and will have to be actively managed by the Concessionaire with oversight by the AATE, OSITRAN (per concession agreement), and DGASA (per environmental permits). Key environmental risks include: vibration and noise during construction and operations, effects and management of tunneling in areas with groundwater, worker health and safety risks due to tunneling operations, and disposal of excavated soil materials. These potential impacts and risks are mitigated principally by the concession contract requirements, including development and implementation of an environmental, health and safety management systems and compliance with project

environmental permits (including the EIA) and other project requirements established by the IFIs. There has also been close coordination among the IFIs involved in the project on all safeguards documents and plans, especially between IADB and the Bank. While the vast majority of communities are expected to support the project because of its benefits, the handling of involuntary resettlement and potential disruptions in the day-to-day lives of people directly affected by construction (even if temporary) could have a large impact on public support. Operators of the conventional and informal public transport system may need assistance to convert or upgrade these services into higher-quality feeders for the Metro or find other work. A key risk mitigation measure will also be a citizen engagement and communications strategy based on transparency and information sharing.

e. Fiduciary. Fiduciary risks are rated as moderate in view of MTC and AATE's well-established Finance and Administrative Units responsible for financial management (FM) activities and the due diligence already carried out for the single contract awarded. The Project's Operational Manual will define important coordination mechanisms and reporting procedures between IFIs and the GoP on FM matters and the review of contract amendments. This should also help mitigate risks in this area as the approval of the Operational Manual by all parties is an effectiveness condition.

f. Sector Strategy and Policies. The implementation of sector reforms, multimodal integration, affordable fare policies and complementary interventions during Project implementation are critical to realizing higher-level social benefits from the Project. This will require arrangements or agreements between the national government and the Municipalities of Lima and Callao. Moreover, the GoP retains all demand risk for the Project and any shortfalls in the expected ridership or fare revenues will add directly to the government's contribution in the form of operating subsidies. This will be partially mitigated by the development of agreements with local government and a multimodal integration and accessibility plan for the initial phases of the Project. The Bank is already actively supporting MTC and AATE in these efforts.

H. Metro Transport Strategy and Complementary Activities for Metro Line 2

26. **The Project is part of a longer-term strategy to support metropolitan transport development in LMR in coordination with other International Financing Institutions (IFIs) and donors.** This strategy to complement the Metro Line 2 Project is currently under development together with AATE. It should be implemented with the initial phases of Line 2 and be financed by Government resources, future IFI operations, and donor resources to be defined. The strategy's architecture will include the required institutional strengthening, policy reforms, technical assistance activities, as well as future complementary investments to ensure the Project's success by defining interventions aimed at the various dimensions of accessibility (i.e. regional, local, universal) and levels of modal integration (i.e., physical, operational, fare) in the LMR. This Strategy will ultimately guide the application of the GoP counterpart funds and become the basis for IFI support in the form of trust funds, technical cooperation agreements, and future loans. While Proinversion is developing other projects in the Metro Network Plan, AATE is developing studies to identify complementary projects and specific investments to ensure the accessibility and integration features of the Metro Line 2 with the public transport network. The strategy's initial activities are summarized below.

27. **Defining complementary investments and policies as part of a Multimodal Integration and Accessibility Plan for Metro Line 2.** Although the concessionaire is required to design and build stations according to international standards of quality and universal accessibility, the accessibility of stations surroundings, the supportive public space and the potential urban renewal is beyond the current scope of the Line 2 concession. It is likely that stakeholders in local government, civil society, local community and users will identify gaps in non-motorized accessibility and multi-modal integration, as well as opportunities for improving public spaces and other social amenities around future stations. Additional investments will be needed for ancillary civil works and goods around key Metro stations and corridors feeding Line 2 to ensure appropriate multi-modal integration and local accessibility improvements. These may include elements of an integrated fare collection system, facilities for buses, pedestrians and bicycling, including safe and convenient crossings and signage, and TOD-related interventions with high-quality public spaces. The GoP, through AATE, has financed similar complementary investments for Metro Line 1 and is expected to continue and improve this strategy for Line 2. For example, AATE has financed about US$6 million in pedestrian infrastructure, crossings and signage within a 50-meter buffer area of Metro Line 1 through legal co-financing and execution agreements with local district governments. In the 2015 budget AATE has estimated US$33 million to extend these interventions to a 400-meter buffer around Line 1.

28. **At least two major transfer stations are expected to be built with Metro Line 2 with physical, tariff and operational integration with other mass transit and feeder bus services**, namely Future Station 28 de Julio (Metro Line 1) and Future Estación Central (*Metropolitano* BRT). Since these are natural transfer points along Metro Line 2 special attention must be paid to these stations. Special attention should also be paid to the terminal station in the Municipality of Ate which will become an intermodal hub with buses and microbuses coming from the east. A holistic integration strategy should go beyond the integration to other motorized transit modes and should include non-motorized accessibility for pedestrians and bicycles (multi-modal). Walking will be the most common mode of access to the Metro Line 2 and the investment plans for the civil works associated to Metro infrastructure is likely to be been limited to the immediate station entrance neglecting the catchment area for pedestrian facilities. These areas should also incorporate elements of universal design to improve accessibility for people with impaired physical mobility, pregnant women, and the elderly. The Bank will build on the support provided to the Municipality of Lima through a PHRD grant focused on piloting improved accessibility around stations of the *Metropolitano* BRT particularly for the physically disabled.

29. **The proposed Integration and Accessibility Plan for Metro Line 2 should include infrastructure works and equipment which go beyond the scope of the concession investments, and require community participation in design, as well as approval and co-financing with the local governments**. Beyond the envisioned multimodal system-wide integration, comprehensive site plans around future Metro stations will need to be designed, piloted and implemented. This strategy should also consider the existing pattern of socio-spatial segregation, by which low-income groups do not benefit from the same opportunities to participate in the city's economic and social activities. Community participation in the planning and decision-making would ensure these local interventions are appropriate and contribute to vibrant and livable communities where people can safely walk, live, work, shop and play. The Bank's technical assistance Strategy will identify these opportunities under a Transit-Oriented Development (TOD)

and participatory placemaking frameworks, complemented with other social strategies for jobs, poverty and gender.

30. **The GoP is also expected to enter into a tripartite framework agreement with the Municipalities of Lima and Callao to facilitate the implementation of the Multimodal Integration and Accessibility Plan in partnership with local governments.** This agreement may include commitments on, inter alia: (i) plans and mechanisms for the physical integration of the Lima Metro Lines 1, 2, and the Metropolitano BRT and other bus systems; (ii) studies for the establishment of an integrated single fare ticket between Metro Lines 1, 2, and Metropolitano BRT; (iii) the reorganization of feeder bus routes and regulation of public transport services around Lima Metro Line 2; and (iv) plans for the improvement of public spaces and facilities for pedestrian, bicycles and traffic management around stations conforming Lima Metro Line 2. One possible path to collaborating with the municipalities is through joint planning and co-financing projects complementary to Line 2.

31. **Institutional Strengthening Plan and Technical Support.** Considering the scale and complexity of the investments to successfully implement Metro Line 2, the challenge of its multi-modal metropolitan integration, complementary interventions, as well as future projects in the Metro Network Plan, the GoP's institutions will require a continuous effort in capacity building and institutional strengthening. Institutions including OSITRAN and AATE are receiving technical assistance and are developing comprehensive plans for institutional strengthening and to increase participatory planning as a beneficiary feedback mechanism. The GoP along with the Bank and other IFIs will define and agree upon additional areas of technical assistance, which shall include the following:

i. Project implementation support and management oversight consultants for Metro Line 2 implementation, including the areas of social and environment management. These consultancy services will target specific or specialized short-term needs to support the oversight and supervision roles of AATE and OSITRAN under the concession contract of Metro Line 2. These activities may also include feasibility and design studies for an integrated fare collection system, bus and bicycling facilities, and TOD-related interventions of high quality public space such as plazas, parks, pedestrian facilities including crossings and signage (including for physically-disabled users).

ii. Studies and policy dialog in support of an Integration and Accessibility Plan for Metro Line 2 to include affordable fare policies, targeted subsidies, impact evaluation, and planning and design of other urban transport investments under a comprehensive land use and transport master plan for the Metropolitan region. MTC and AATE are conducting a number of important studies on the physical, operational and fare integration of the existing and future Metro lines to define a set of interventions that can be financed under a follow-on investment plan. The Municipality of Lima has plans to extend the current *Metropolitano* BRT and has initiated a system-wide reform of the bus system with the implementation of the *Sistema Integrado de Transporte* (SIT) and priority bus corridors. The Municipality of Lima is also working on a land use master plan for the metropolitan region with a 2035 vision (PLAM2035) to coordinate urban development and (re)development opportunities around the major transit infrastructure projects. These Project activities will support consultancy services needed to continue the planning and design of future urban transport investments under

a comprehensive land use and transport master plan for the Metropolitan region, in particular around the coordination and integration of the future Metro L3, the Lima's SIT and its bus corridors and the land use and zoning instruments associated development process of the PLAM2035. Finally, and in order to evaluate ex post impacts of the Metro Line 2 project and complementary works beyond the life of the loan Project, a robust methodological approach for impact evaluation will be designed including the development of the baseline.

i. Capacity-building for stakeholder agencies in transport planning, policy formulation and regulatory reforms (including the reorganization of conventional public transport modes, fleet modernization and rationalization, and job transformation strategies), and institutional coordination with the eventual creation of a Metropolitan Transport Agency or Authority. These activities may include consultancy services focused on institutional strengthening and the evolution process towards a more efficient and effective institutional framework and supporting regulatory reforms, including a comprehensive plan for the reorganization of public transport services around Line 2.

ii. Studies and comprehensive site plans for potential Metro Line 2 Transit-Oriented Development (TOD) pilot stations with complementary works, a community-based economic development strategy, participatory placemaking as a beneficiary feedback mechanism, and feasibility studies for potential financial land-based value capture and climate-financing mechanisms. These studies and plans would constitute a set of interventions that can be financed under a follow-on investment plan. Based on international experience, there is potential for using some land-based value capture mechanisms and leverage private sector investment and participation for future complementary works. This would also induce more local economic development and better urban design. The identification of potential climate change financing instruments or operations (e.g., Nationally Appropriate Mitigation Actions, NAMAs, or potential new instruments under the new Green Climate Fund and Peru's Intended Nationally Determined Contributions, INDCs) could also benefit the Project or support additional complementary works.

Technical Assistance Program with Partners

32. The World Bank is working closely with all other IFIs (namely IADB, CAF, AFD and others) to support this project and a complementary metro transport strategy with a coordinated technical assistance plan to be funded initially with Trust Funds and other donor resources. Potential topics and activities being discussed include those in the table below.

Table 2: Technical Assistance Program

Area/ Beneficiaries	**AATE/MTC**	**OSITRAN**	**MEF**	**Municipalities and Communities**
Supervision of designs and construction of Metro Line 2	Support from Metro de Santiago, EDIs, contingency planning, and rolling stock specifications (CAF) Support on strengthening social and environmental	Workshop on design and construction supervision of underground Metro civil works (WB)		

	management systems (WB, IADB)	Supervision consultant contract (GoP)		
Physical integration	Workshop on integration and institutional design structures (WB) Feasibility and design studies for complementary works beyond concession contract (Metro L2); multimodal and holistic integration strategy	Workshop on integration and institutional design structures (WB)	Workshop on integration and institutional design structures (WB) Design of land-based value capture mechanisms to leverage private investment and participation for the proposed complementary works. Identification of potential climate change financing instruments or operations	Workshop on integration and institutional design structures (WB) Technical assistance to participatory planning and design of TOD and placemaking Metro L2 station areas and integration into local land use and zoning plans with a community-based local economic development strategy
Tariff integration	Workshop on integration and institutional design structures (WB) Design and procurement elements of an integrated fare collection system and tariff policy strategy analysis	Workshop on integration and institutional design structures (WB)	Workshop on integration and institutional design structures (WB)	Workshop on integration and institutional design structures (WB) Design and procurement elements of an integrated fare collection system and tariff policy strategy analysis
Operational integration, bus system reorganization and supply reduction	Workshop on integration and institutional design structures (WB) Design and implementation strategy of the bus service reorganization, vehicle scrappage and job transformation Strategy	Workshop on integration and institutional design structures (WB)	Workshop on integration and institutional design structures (WB)	Workshop on integration and institutional design structures (WB) Design and implementation strategy of the bus service reorganization, vehicle scrappage and job transformation Strategy
Institutional coordination (policy and regulation)	Workshop on integration and institutional design structures (WB) Institutional framework support towards a multimodal plan and Metropolitan Transport and Land Use Authority	Workshop on integration and institutional design structures (WB)	Workshop on integration and institutional design structures (WB)	Workshop on integration and institutional design structures (WB) Institutional framework support towards a multimodal plan and Metropolitan Transport and Land Use Authority

Annex 3: Implementation Arrangements

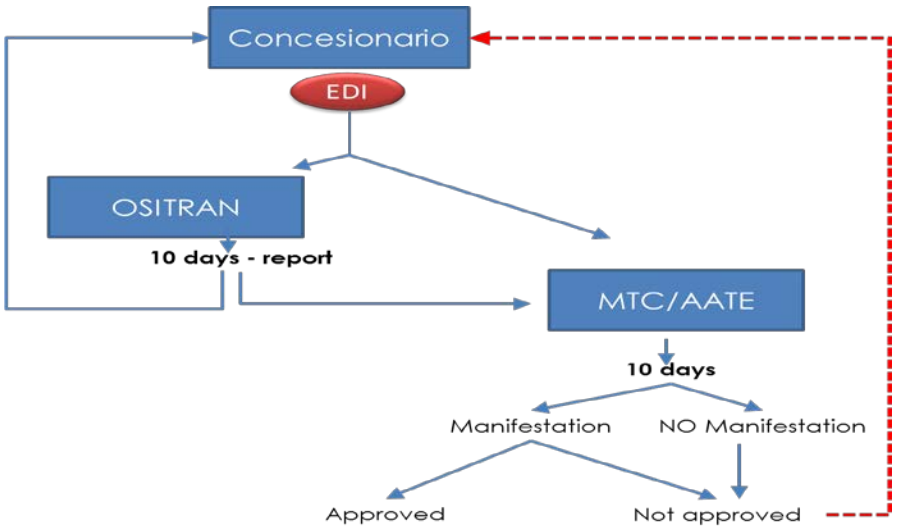
PERU: Lima Metro Line 2 Project

A. Project Institutional and Implementation Arrangements

1. The MTC is responsible for overall implementation of the Project while the technical aspects and administration of the funds are delegated to AATE. MTC, through AATE, will make payments against progress in the delivery of construction works (including related systems) and purchase of rolling stock in accordance with the schedule established in the EFR and EDIs. Works and rolling stock will be delivered in milestones (*Hitos de Obra*). The completion and certification of these milestones gives rise to a payment obligation on the part of MTC. OSITRAN is responsible for contract supervision and therefore for the validation of EDIs for purposes of payments to be made to the Concessionaire. AATE will support OSITRAN in this task by providing the institution with technical input for the revision of the EDIs as well as be responsible for issuing the payment process once the EDIs is validated.

2. The Concessionaire, responsible for the detailed engineering designs both for civil works and rolling stock, shall prepare the Project's Definitive Engineering Studies (EDIs). Once prepared, the EDIs shall be delivered to OSITRAN and MTC for their respective revision: For Phase 1A of the Project, OSITRAN receives the EDIs and has up to 10 working days to analyze the document and submit its opinion report to MTC, with a copy to the Concessionaire. MTC, through AATE's technical report, will have another 10 working days to issue its opinion. In case MTC approves the EDI, the Concessionaire can start or proceed with the works. In case of comments or objections, the Concessionaire will have 10 calendar days to solve the questions or issues raised. In the absence of a response by MTC, the EDI will be considered as not approved.

Figure 1: Project Design Process



3. The same process applies to Phases 1B and 2 of the Project, however, the revision deadlines allowed for OSITRAN and AATE are 20 days instead of 10 days. In case there is any dispute

between MTC and the Concessionaire regarding questions or issues raised in relation to an EDI, the matter will be decided by an entity with recognized technical expertise to be selected by OSITRAN among options indicated by MTC and the Concessionaire.

4. The main coordination mechanism for implementation support between the IFIs involved in the Project is a single Operational Manual (OM) to be approved by the GoP. The OM will described supervision and reporting requirements that will be in common for all IFIs in an effort to simplify coordination and ensure information sharing.

B. Financial Management, Disbursements and Procurement

Financial Management

5. **The Bank has conducted its Financial Management Capacity Assessment for the Project.** Based on the work done with the MTC, AATE and OSITRAN, as well as discussions with main co-financiers, this section presents a general description of the financial management and funds flow arrangements that will be put in place by MTC and AATE and reflected in the Operational Manual.

Summary of financial management arrangements.

6. The financial management responsibilities will be shared between (i) the Ministry of Transport (MTC) and AATE, with the MTC responsible for registering and executing project budget, as well as for management and administration of fiduciary fund that will finance the payments of the PPP, while the AATE will be in charge of contract administration, including recording and accounting for project transactions, and preparation of financial reports and disbursement requests to different financiers to be issued and submitted by the MTC. Given that the project will use several sources of financing, there is agreement to set up a fiduciary fund (*fideicomiso*) in Citibank in order to ensure strong budgeting, accounting and funds flow arrangements, as well as internal controls that support timely and accurate recording of project transactions. In addition the reporting requirements that will be detailed in the Operational Manual make provisions for reliable information for monitoring and supervision purposes. The remaining financial management risks to the operation are (i) an even request of funds across the financiers from MTC and AATE; (ii) the risk of availability of local counterpart financing related to future income flows; and (iii) accurate and timely forecast of future funding needs to ensure sufficient liquidity for payments to the concessioner. The financial management and disbursement arrangements are reflected in the Operational Manual for the Project that has been reviewed and agreed with all financiers of the project and is a condition for effectiveness..

Detailed financial management arrangements.

7. **Organization and staffing.** Both MTC and AATE have well established Finance and Administrative Units with qualified staff covering the functions of budgeting accounting and treasury. Before project operation starts, a workshop would be organized with the MTC, AATE,

OSITRAN, and participating Donors, as part of project launch to reinforce the financial management arrangements.

8. **Strategy and Budgeting.** MTC in coordination with MEF would be in charge of strategy, budget formulation and execution. MTC would prepare the Project annual implementation plan and procurement plan as well as update the disbursement criteria that will be used to request funding from each of the financiers when payments are due.

9. The Project Operational Manual that has been prepared describes the main roles and responsibilities and will be approved by the GoP as a condition for effectiveness. In addition, the manual includes a section describing detailed process and procedures for budget preparation and approval, including coordination between MTC, AATE and OSITRAN to enforce timely preparation and approval of budget; adequate recording of the approved budget; and control of budget execution; management of fiduciary fund, recording transactions, and payments processing and what systems will be used for the recording and reporting on the administration of funds.

Accounting and Information System.

10. **Internal control.** MTC, AATE and OSITRAN will have to comply with the internal control standards issued by the *Contraloria General del Estado*. In addition, AATE will need to comply with its own internal control procedures, including the approval process to request payments from the fiduciary fund (*fideicomiso*) that will be set up in Citibank, and the controls put into place specifically for this project to ensure that all payments made to the Concessionaire are for EDIs that have been approved and validated. The Operational Manual describes the specific steps and procedures that must be followed as part of the internal controls applicable for this operation.

11. **Financial Reporting.** With the objective of supporting harmonized arrangements, AATE will have the responsibility for the preparation of a single set of project financial statements acceptable to all co-financiers. Project financial reports will be prepared under the cash accounting basis. First, the financial data is recorded in the SIAF system in local currency. After a process performed by the IT personnel, the data gathered in the SIAF is migrated quarterly to another system called SIGA-NET which allows obtaining project financial reports and the accounting of payments in US Dollars. This process may be performed at any time depending on the needs of the administration department. These project financial reports will be adapted by the AATE`s IT personnel to be harmonized with the World Bank requirements for the multiple sources of financing

12. The Project annual financial statements will include financial information for the entire Project. AATE will need to prepare project interim financial reports and annual financial statements in U.S dollars, covering all project activities and all financing sources. For this reason, AATE will need to adapt the SIGA-NET financial system.

13. Project-Interim financial reports (IFRs) for reporting purposes should be harmonized by all co-financers and will include: i) brief background of project status as of the end of each period; (ii) a statement of sources and uses of funds and cash balances; and (iii) statement of cumulative investments with cash forecast for the next period; (iv) a disbursement statement for each co-financier; and (v) a statement of sources and uses of funds and cash balances for the multiple co-

financiers in the project. These reports will be submitted on semi-annual basis, no later than 45 days after the end of each calendar semester.

14. The Project annual financial statements will include financial information for the entire Project. AATE will need to prepare project interim financial reports and annual financial statements in U.S dollars, covering all project activities and all financing sources. For this reason, AATE will need to adapt the SIGA-NET financial system.

15. **Auditing.** For this particular project with several co-financers, specific harmonized auditing arrangements will be agreed, including agreement on a single set of audit terms of reference. Audit TORs have been harmonized with all co-financers and are described in the Project Operational Manual.

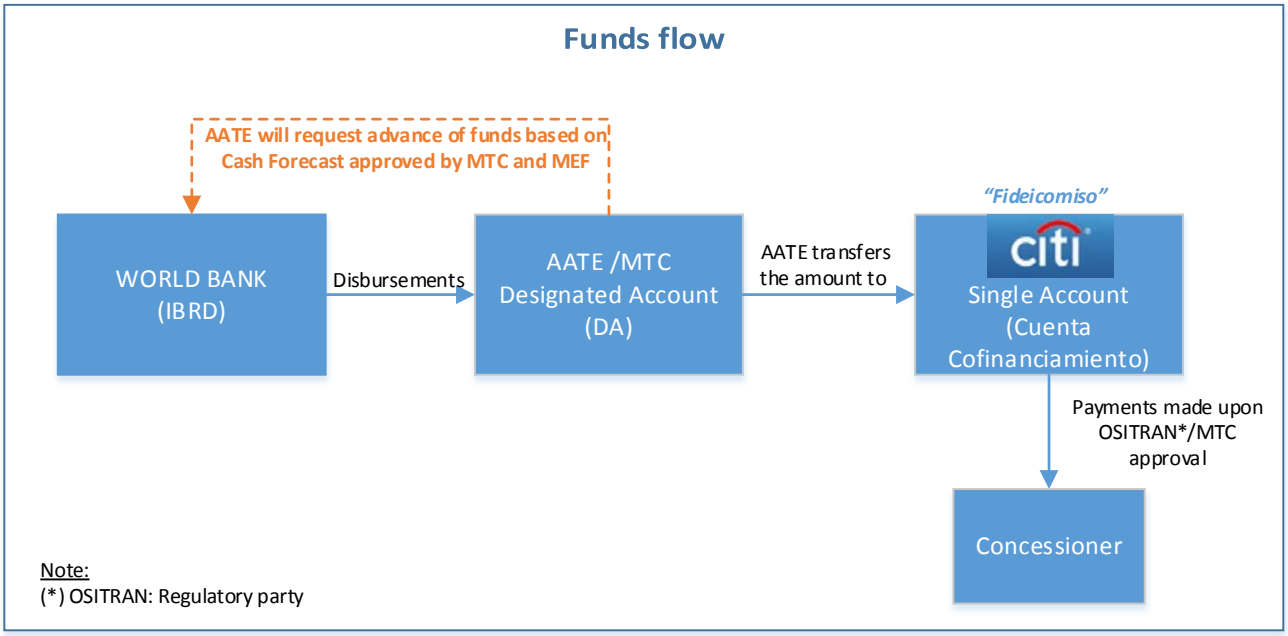
16. Audit of annual financial statements of the Project will be conducted in accordance with International Standards on Auditing (ISAs) issued by the International Federation of Accountants (IFAC). Audited financial statements will have to be furnished to all co-financers review not later than four months after the end of each fiscal year or other period agreed with all co-financers (not exceeding 18 months) when due to project circumstances, it is more cost effective to join periods to be audited. Auditors should submit: (i) an opinion on the Project financial statements; and (ii) management letter. Regarding audit costs, as per the cost table presented so far, it is expected that audit costs would be financed out of local counterpart funds from MTC.

17. In accordance with the World Bank's Access to Information Policy, the annual audited financial statements of the Project will be made publicly available by the Bank upon receipt. The Borrower agrees to disclose the audited financial statements to the public in a timely fashion.

Funds Flow and Disbursement Arrangements.

18. **Disbursements of Loan proceeds from IBRD**. The Bank will disburse Loan proceeds using the Advance and Reimbursement methods. Bank loan proceeds will follow Bank's disbursement policies and procedures as described in the Disbursement Letter and the disbursement criteria described in the following paragraph.

19. Given the size and nature of payments envisaged under the PPP component of the project, disbursements will be made to a segregated designated account held by the MTC with fiduciary responsibility delegated to AATE. The amount of funds advanced from each source of financing will be made on the basis of cash forecast for a given period, normally a semester, into separate and segregated bank accounts. The forecast will reflect the amounts to be disbursed from each financier based on the payment schedules under PPP contract and specific disbursement criteria agreed between the MEF and MTC. Once the funds from each financing source are deposited in segregated bank accounts, the AATE will transfer the amounts required to a single account (*Cuenta Cofinanciamiento*), set up in Citibank under the *fideicomiso* agreement, from where the funds will be pooled in order to make payments to the concessioner following the PPP's payment schedule (see figure below).



20. The MTC will request disbursements from each source of financing based on the following criteria following the general principles of efficiency and economy and reflected in the Operational Manual:

(a) Order of Financing: The MTC will request disbursements based on the first in/first out principle. This means that the financing that is first available will receive the first disbursement requests until all funds are depleted. This will also serve to deplete each source of financing as quickly as possible in order to allow for follow on operations and also minimize commitment costs.

(b) Nature of Expenditures: The MTC will request disbursements depending on the nature of the costs and the source of financing for each type of cost. For example, the IDB is only financing works, while the World Bank is financing works, systems, and rolling stock, and the CAF is financing works, materials and labor.

(c) Liquidity Needs. The amount the MTC will request in each disbursement will be based on the payment schedules under the PPP contract and the anticipated date that each milestone will be achieved.

21. For WB disbursement reporting: MTC/AATE will report on the use of Bank financing using a custom disbursement report following the format agreed during appraisal and attached to the Disbursement Letter. MTC and AATE both have the capacity to track the funds from each financier during the initial deposit of funds to each segregated account and then for the transfer of funds from the individual segregated accounts to a pooled bank account (*Cuenta Cofinaciamiento*) in Citibank. Payments will not be made from the segregated accounts funded by each co-financier but rather from the *Cuenta de Confinanciamiento* where the funds will be pooled together to make a single payment to the concessionaire. AATE will control and monitor these payments and

prepare the financial reports and statement of expenditures of the project. Detailed processes and procedures have been agreed and will be reflected in the Operational Manual of the project.

Loan proceeds would be disbursed against the following expenditures categories:

Category	Amount of the Loan Allocated (expressed in USD)	Percentage of Expenditures to be financed (exclusive of Taxes)
Goods, Works, Non-consulting Services and consultant services	300,000,000	100%
TOTAL AMOUNT	300,000,000	

22. **Bank Supervision.** Financial Management supervision would include on-site and off-site supervisions. On site supervision missions will be carried out at least twice a year to the extent possible during the first year and later calibrated to twice a year. Off-site supervisions will comprise desk reviews of interim financial reports and audited financial statements.

C. Procurement

23. The contract for the Line 2 of the Metro of Lima is a Design, Finance, Build, Operate and Transfer model for a duration of 35 years. The concessionaire was selected by ProInversion, the national investment agency of Peru, in accordance with the national legislation, in particular the Legislative Decree No. 1012 on PPP, and the Supreme Decrees 059-96-PCM and 060-96-PCM which govern concession to the private sector of infrastructure in Peru.

24. The selection process was carried out in two steps, a pre-qualification stage and a bidding stage (including the final technical and financial bid) and was to be awarded to the Consortium that bid the lowest public sector contribution to initial investment and operation. After several extensions of the date for pre-qualification submission, 3 consortia ultimately answered to the invitation for pre-qualification: “Nuevo Metro de Lima”, “Metro Subterraneo de Lima” and “Metro de Lima – Linea 2”. All consortia were reviewed and deemed qualified for the concession by Proinversion. They were then invited to present their technical and financial proposal for the second stage.

25. At the date of bid submission, on March 21st 2014, only one consortium “Nuevo Metro de Lima” presented a bid. This bid was evaluated and deemed compliant to both the technical and financial criteria, and was finally awarded to the Consortium for a total investment of US$5,836 million, which was below the maximum reference investment price planned by MTC. The two

other prequalified consortia, "Metro de Lima – Linea 2"[40] and "Metro Subterraneo de Lima"[41], informed Proinversion that they were not going to submit a bid considering the financial conditions imposed to the concession contract, in particular with regard to the maximum capital and operational investment that would be invested by the Government in this operation.

26. To determine if the selection process was done in accordance with Bank procurement policy, in particular section 3.14 (a) of the Procurement Guidelines, and standard international practices, the Bank looked at the following aspects: (i) eligibility under Bank-financed projects; (ii) Fraud and Corruption provisions; (iii) Transparency; (iv) Competition; (v) Qualification conditions; (vi) Evaluation criteria; (vi) Fairness; (vii) Complaint system; and (viii) Arbitration:

(i) **Eligibility**: the winning consortium is comprised of the following companies: Cosapi S.A., Impregilo SpA, Iridium Concesiones de Infraestructura SL, Dragados, SA, Ansaldo Breda SpA, and Ansaldo STS SpA. None of these companies, as part of the consortium or sub-contractor, is currently debarred or suspended by the World Bank; none of them are apparently subject to any other ineligibility issue as provided by Bank policy.

(ii) **Fraud and Corruption**: fraud and corruption provisions of the World Bank, including "the audit clause" were included in the bidding documents (Annex 3).

(iii) **Transparency**: the different versions of the bidding documents, as well as the amendments and information notices ("Circulars") were published on the external website of Proinversion; the detailed technical specifications were made available to all pre-qualified bidders in order for them to finalize their bid. Although the procurement notice was not published in a newspaper or magazine of international diffusion, Proinversion carried out several road shows in anticipation of that operation, in addition to the national publication in 3 newspapers and the external website. The participation of 3 consortia representing 16 companies and 8 different countries show that advertisement was adequate for that type of operation.

(iv) **Competition**: time allowed for bid submission was relatively short after the initial prequalification stage (6 weeks) for that type of operation. However, as initial bidding documents and technical specifications were available to candidates before that date, we could consider that the firms had sufficient time to prepare their final bid. Documents were regularly modified after their initial release, but it seems that it was not material enough to prevent potential candidates to participate, although ultimately one consortium submitted a bid.

(v) **Qualification conditions**: qualification requirements, whether financial or technical were regularly modified along the selection process; accordingly the initial qualification requirements, as set forth in January 2013, were not similar to the ones ultimately

[40] "Metro de Lima – Linea 2" comprised only firms from Peru, although some of them were local subsidiaries of foreign firms: Odebrecht Latinvest Peru S.A.C. (Peru and Brazil), Graña y Montero S.A.A., Constructora Andrade Gutierrez S.A. sucursal Peru (Peru and Brazil), and Constructora Quieroz Galvao S.A. sucursal Peru (Peru and Brazil). System equipment was to be provided by Bombardier European Investments SLU (Spain); rolling stock was to be supplied by CSR Zhuzhou Electric Locomotive Co. Ltd (China) and operational technical assistance by RATP Development S.A. (France).

[41] "Metro Subterraneo de Lima"comprised Astaldi S.p.A. (Peru and Italy) and Controladora de Operaciones de Infraestructura S.A. de C.V. (Mexico). Thales España GRP S.A.U. (Spain) was to supply the system equipment, Contrucciones y Auxiliar de Ferrocarriles S.A. (Spain) the rolling stock and operational technical assistance was to be provided by Ferrocaril Metropolita de Barcelona S.A. (Spain).

published in February 2014. This is the result a "dynamic qualification process" practiced by Proinversion which modified the requirements in accordance with the comments and suggestions of potential bidders on the initial documents. According to Proinversion, this method has proved useful as it allows the procuring entity to rely on the market and its expertise, rather than on its own resources, to define the best and most technically relevant requirements for the operation. Not all suggestions and comments were translated into amendments to the bidding documents and all modifications were vetted by Proinversion before being introduced into the documents. This method did not apparently result in abusive rejection and disqualification of bidders as all 3 participants were ultimately pre-qualified for the contract.

(vi) **Evaluation criteria**: the contract was to be awarded ultimately to the bidder with the lowest economically cost to the GoP and a compliant bid. The formula used to determine that cost was based on investment by the concessionaire and the capital investment and operational fee it would require from the Government. Both elements came with a cap. The winning consortium came with a requirement for public investment much lower that the cap imposed by the Government.

(vii) **Fairness**: the selection process for the contract appeared to have been fair to all participants and that there was no discrimination based on nationality or other elements during that process. The certification of official foreign documents by Peruvian Authorities, which represents often an unnecessary burden for foreign bidders, did not seem to have been perceived as an obstacle given the large foreign participation to this process.

(viii) **Complaint System:** no administrate or legal complaints from bidder were received[42].

(ix) **Arbitration**: the review conducted by the procurement team of the contract has been essentially limited to contract dispute resolution. Review of the provisions applicable to contractual disputes shows that the contract is subject to arbitration by ICSID. This solution would make the Bank in a potential perceived conflict of interest, if any major dispute would arise out of the performance of the contract. If the Bank would finance this contract, the Bank may suggest to the parties an alternative arbitration institution and rules such as the International Chamber of Commerce of Paris or any other arbitration institution recognized internationally.

27. After that review, the Bank concluded that the process for the selection of the concessionaire was done in accordance with the applicable Bank procurement policy, including section 3.14 (a) of the Procurement Guidelines of January 2011, and that the process was acceptable to the Bank[43].

28. The Bank will nonetheless continue to be engaged in the supervision and monitoring of the contract, in cooperation with the other IFIs and bi-lateral donors. Any substantial change to the contract, such as amendments significantly affecting contract conditions, modification of contract price, change in membership of the consortium and/or of its suppliers, will be subject to Bank review, in accordance with Bank policy. The Project's Operational Manual, developed jointly with other IFIs, will establish procedures to ensure that the Bank is properly informed of any modification to the contract in order to be able to exercise its fiduciary function. Moreover, cost

[42] Complaints were subject to a hefty surety of 1% of the contract amount (approximately $45 Million).

amendments for the Line 2 Project are subject to strict contractual conditions and a 15 percent cap set by Peruvian law for PPP projects.[44] Peruvian law permits modifications to the financial conditions of the concession contract in order to reach financial closure.

[44] Peruvian Regulations (Decreto Supremo Nº 127-2014-EF, section 15.1) determine that if a proposed contract amendment leads to a change in a PPP project's scope or increases the total cost by more than 15%, the GoP may consider issuing a new tender as an alternative to a PPP contract renegotiation. In this sense, the GoP may decide to procure the remaining construction works through traditional public procurement or rebid the PPP contract. There has been one single case in which a project went over this 15% cap (Interoceanica roads PPPs) and to avoid the application of the rule described above the Peruvian Parliament approved an exception (Law 29,309 from 2008) allowing the concessionaire to keep the contract and finalize works.

Annex 4: Social and Environmental (including safeguards)

PERU: Lima Metro Line 2 Project

A. Social (including safeguards)

1. **The project Resettlement plans are being be developed and implemented by AATE.** This agency developed land acquisition and resettlement experience during the construction of Line 1. AATE is making progress in the negotiations with the landowners affected by Phase 1A and has already reached agreements with some of them and delivered compensation payments.

2. **The overall social impacts of the Project will be positive.** The Lima Metro Line 2 Project will significantly improve the mobility options in the LMR, particularly for the lower income segments of the population that rely on public transport for access to jobs and services. The positive impacts are likely to be greater in peripheral locations, where residents are often excluded from the city's economic, social, and cultural opportunities. Similarly, the Project is likely to generate tangible benefits for socially excluded groups, including female-headed households, people with disabilities, the unemployed youth and other vulnerable minorities.

3. Latin America and the Caribbean Regions **Land acquisition will cause economic and physical displacement.** Resettlement plans are being developed and implemented by AATE. The 35-km mostly underground alignment will only require land acquisition in the areas needed to build stations and ventilation shafts. According to estimates based on preliminary designs, Line 2 will affect 338 lots and Line 4 Branch will affect 38 lots, for a total of 376 lots. Of these, 279 are privately owned and 98 belong to public entities. Two stations (16 and 26) will affect lots occupied by shopping centers.

4. **A Resettlement Policy Framework (RPF) called the PACRI (*Plan de Compensación y Reasentamiento Involuntario*) was prepared and disclosed as part of the Environmental Impact Assessment (EIA) for the Project.** The RPF, which includes a compensation framework and a social management plan, was reviewed by the World Bank and is in accordance with relevant safeguard policies. The RPF was published as part of the EIA by Government on or before April 28, 2014 and on the World Bank's external website on October 22, 2014 (see table below). All the detailed resettlement action plans (known as specific PACRIs) to be prepared during project implementation as each phase is designed and will be consistent with the RFP.

5. **Detailed designs are currently only available for Phase 1A affecting 41 properties, 21 owned by public entities (gratuitous transfer) and 20 privately owned (lots that do not represent social impacts and 12 informal businesses).** AATE has reached agreements with all of the Phase 1A landowners and delivered compensation payments. The acquisition of the 20 privately owned lots is completed and will not cause physical displacement, except for the acquisition of one lot required for a ventilation shaft (PV20)[45].

[45] In February 2015, 12 informal businesses that occupy a section of this lot were displaced. Some of the owners of 12 informal businesses that operate in some of the expropriated properties have rejected AATE's compensation offers to date and sent a letter to AATE in June 2014 claiming possession rights. Meanwhile, AATE initiated legal actions

6. **Land acquisition for Phase 1A was completed in May 2015.** A detailed resettlement plan was prepared to document land acquisition to date and to address the displacement of the 12 informal businesses. Land acquisition for the other sections will be completed by AATE once the detailed designs become available. Resettlement plans will be prepared to address the adverse impacts of land acquisition, according to the provisions of the Project's Resettlement Policy Framework.

B. Environment (including Safeguards)

7. **The Project is classified as Environmental Category A as per Bank Operational Policy on Environmental Assessment (OP/BP 4.01) due to the potential impacts associated with large scale construction and the relatively large geographic footprint in an urban environment**. While the Project does not anticipate significant impacts on physical cultural resources based upon the project EIA and supplemental information, the Bank policy OP/BP 4.11 on Physical Cultural Resources is triggered given the potential during construction of encountering cultural and potential archeological sites along the alignment (see details below). The Bank policy OP/BP 4.09 is triggered since the project will during the operation phase require the limited use of regularly available pesticides for pest control (e.g., rodents, etc.) in the tunnels. Applicable mitigation and monitoring measures related to both policies are established in the Project environmental management plan and concessionaire environmental requirements.

8. **The project may have long-term positive environmental benefits, in particular related to greenhouse gas emissions (GHGs), air quality and other improvements in the health and quality of life of the residents of Lima.** The Project was estimated to reduce GHG emission from vehicles powered by fossil fuels by 30,000 to 50,000 tons per year of CO2-equivalent under the conservative base demand scenario assumptions. The level of emission reductions and climate change mitigation will be primarily a function of the migration of trips from road-based modes consuming fossil fuels to the more efficient electric Metro and its feeder system. In the same way, the project may also contribute to reductions in the number of accidents and air pollution.

9. **An Environmental Impact Assessment, including an Environmental and Social Management Plan (ESMP), has been developed for the Project.** The MTC's Directorate General on Socio-Environmental Matters (DGASA) classified the project under the Peruvian regulatory system as Category II and approved the Terms of Reference for the project Environmental Impact Assessment. The EIA was prepared by a consortium consisting of Geodata,

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to evict these occupants and the case is now in the hands of the *Procuraduría General de la Nación* (Attorney General's Office). The Bank informed AATE that no evictions should take place until the Bank has approved the Resettlement Plan for Phase 1A and until there is clear evidence that all affected parties have received compensation offers that meet the standards of the Resettlement Policy Framework and that are based on a clear understanding of the legal rights of the occupants of the business structures. In addition to the resettlement instruments, the GoP has prepared a *Plan de Emprendimiento Económico* and a Social Management Plan. The parties involved in the case of the informal businesses ultimately negotiated with AATE compensation levels that are substantially consistent with the Bank's policies. So far 8 out of the 12 parties have accepted the compensation offered and AATE is offering a package of social/family assistance along with the compensation. The Bank's specialists outlined a contingency plan (that would make immediate payments to the parties consistent with Peruvian laws and the Bank's OP4.12) before construction begins.

ESAN and Serconsult. The Project EIA is based and supplemented by upon various detailed technical and design studies, including an evaluation of alternatives, geologic investigations, feasibility study, and project detailed design that were developed by international consultant firms contracted by the MTC. Consultation was performed associated with the EIA development, including disclosure of the draft EIA (see below for details). The EIA and the Project environmental license was issued by DGASA after various public consultations (*Resolución Directoral* N° 459-2013-MTC from November 16, 2013).

10. **In terms of potential negative environmental impacts and risks, in addition to typical infrastructure construction impacts which are localized and of short duration (e.g., generation of noise, dust, waste management, etc.), there are some project specific potential impacts and risks**. Some potential significant impacts during construction are: effects on soil stability or subsidence during tunnel excavation or vibrations that may cause damage to the structure of buildings, traffic congestion, noise and dust around metro station locations, transport and disposal of soil/excavated material from the tunnel and station excavations, possibility of archaeological chance finds and damage, impacts on cultural physical resources, worker health and safety risks in tunneling and excavation works, and decreased accessibility to businesses and homes in the immediate vicinity of metro stations. While the project design does not directly significantly impact physical cultural resources, there are five resources in the direct area of influence that have been identified. Potential significant operational phase impacts or risks include: vibration impacts on buildings, waste management of metro rail car maintenance facilities, and risk of fire, explosion or other emergencies. Cumulative impacts were considered in the EIA and supplemental EIA, and no significant cumulative negative impacts are anticipated since there are no other established projects within the Project area of influence that would result in significant cumulative impacts and given the characteristics of the metro line project (e.g., within a metropolitan urban area already developed, intended users are people already residing in established urban areas).

11. **Evaluation of project alternatives were considered as part of the EIA and supplemental EIA, and also in prior studies.** In December 2010, with the aim of expanding mass transit provision, the GoP approved a Metro Network Plan for Greater Lima and Callao by Supreme Decree which evaluated a range of transportation alternatives including various metro options. The 2012 Project Pre-feasibility study, supported by international consultant firms, also evaluated alternatives and recommended and the GoP approve a new 27-km subway line (known as the Metro Line 2 'Project' and including an 8-km branch of the future Metro Line 4) as the top urban transport priority. Five principal layout options were assessed based upon economical and technical viability, including demand, costs and environmental benefits, and social aspects. A multi-criteria analysis was used considering functionality, use of the territory, cost, profitability, social impacts, and environment. The Project profile and preliminary environmental assessment analyzed alternative alignments and also construction methods for the sections between stations, including open excavation (e.g., cut and fill), excavation in tunnels using mechanized excavations with TBM and non-TBM[46]. As part the project design finalization, measures were taken to help prevent negative environmental and social impacts, such as the optimization of the layout of the

[46] Estudio de Preinversión a Nivel de Perfil de la Línea 2 y Tramo de la Línea 4 del Metro de Lima" (Consorcio Geodata-ESAN-Serconsult, 23 de Octubre 2012) y "Estudio de Preinversión a Nivel de Factibilidad de la Línea 2 y Tramo de la Línea 4 del Metro de Lima" (Consorcio Geodata-ESAN-Serconsult, 4 de Julio 2013)

underground line (e.g., diversion to avoid affecting the archaeological site of Huaca San Marcos) and relocation of ventilation shafts and stations (e.g., relocation of the July 28 station, adjustment of ventilation well to avoid reserved zone of the archaeological site of Puruchuco).

12. **The ESMP consists of numerous specific environmental and social mitigation and monitoring programs.** The ESMP includes programs/measures for: solid and liquid waste management, air emissions, noise, vibrations, green areas, community health, environmental liabilities, worker health and safety, traffic management, infrastructure services, training, spill and contingencies, emergencies, environmental monitoring, compensation and resettlement for properties affected, community participation, community relations, local contracting, purchase of local services, and closure. The ESMP is being enhanced by the concessionaire as part of their development of an Environmental Health and Safety Management System and specific quality control plans required under the concession contract including pest management and archeological and historical resources (see below for details). Also, many Project engineering design components provide environmental impact prevention or minimization. For example, the constructive method of tunnels (avoids significant surface disturbances and associated impacts), construction processes to reduce the risk of subsidence of soil or use of special fasteners between the rails and coating with a blanket of elastomer in the tunnel to reduce the level of vibration in pre-selected areas, and emergency event design aspects. The ESMP identified various potential sites for disposal of soil from tunnel and station construction (approximately 10.3 million m^3), and recently the concessionaire has received authorization from DGASA for use of an existing authorized site (San Martin de Porres, approximately 17 km from Tramo 1A) for disposal of the approximately 3.5 million m^3 from the initial tramo of construction.

13. **Various public consultation meetings/events were performed in August and September 2013 associated with the EIA development.** The environmental licensing process involved stakeholders from district and provincial municipalities in the Project area the regional Governments of Lima and Callao. Eight (8) public consultations on the Project and EIA were held in August and September 2013. Participation ranged from approximately 35 to 110 persons, and the consultation consisted of presentation of project description and EIA (potential impacts, proposed mitigation measures and monitoring programs), stakeholder comments and questions, and responses to comments. Additionally, AATE undertook information events and established an Information Center to provide information and collect stakeholder comments. Stakeholder input was also received as part of the development of the Metro Network Plan for Greater Lima and Callao and the Metro Line 2 Feasibility Study. Additional stakeholder engagement will be performed during project construction and operation as established in the Project ESMP and concessionaire stakeholder engagement plans. The Bank is also working with AATE to undertake routine proactive information disclosure on project status to local stakeholders, and will be established as part of the Project Operation Manual.

14. **A supplemental EIA was developed to address requirements from the IFIs** (primarily based on IADB and World Bank working jointly) which includes additional information on evaluation of alternatives evaluation and specific key potential environmental impacts and management measures. The supplemental EIA was developed by the consulting firm ERM in conjunction with the government, finalized in October 2014 and published on the World Bank's external website on November 24, 2014. AATE has presented the supplemental EIA to DGASA for its consideration to be included as part of the Project environmental permit. The supplemental

EIA includes: more comprehensive presentation of the analysis of alternatives for the Lima Metro Line 2 alignments and construction techniques, based upon previous studies and reports; more detailed baseline related to physical cultural resources and preparation environmental and social sensitivity maps along the alignment; enhanced assessment of noise and vibration potential impacts, traffic management during transport of spoil materials from tunnels to the final disposal sites, potential impacts on underground water and indirect impacts; more detailed assessment of potential social impacts due to construction, such as accessibility to houses and businesses and effect of traffic detours and congestion; inclusion of a Resettlement Plan and compensation of welfare losses on the basis of World Bank and IADB involuntary resettlement policies; additional environmental management recommendations for construction and supervision; and additional recommendations for future stakeholder consultations.

15. **While the project does not anticipate significant impacts on physical cultural resources based upon the project EIA and supplemental information, this policy is triggered given the potential for chance finds of pre-Hispanic artifacts**. There are five historical resources identified with the area of project influence, but none are presently anticipated to be directly affected by project construction. The concessionaire is required under the concession contract to comply with all applicable archaeological and historical resource requirements established under Peruvian law and will implement an Archaeological Assessment Program to obtain an Archaeological Remains Inexistence Certificate (CIRA) from the Ministry of Culture before the start of construction works and implement an Archaeological Monitoring Plan to identify archaeological findings, and as needed, implement a chance finds procedure. The ESMP contains a program for archeological mitigation which is being enhanced as part of the concessionaires development of an environmental management system. The associated costs for this mitigation and monitoring is part of the overall fixed cost for the concession.

16. **Responsibilities for project's environmental management are with the government and the concessionaire.** AATE is the responsible governmental entity under the Project loan for environment matters, including project supervision, coordinating environmental management of works to clear infrastructure interferences along the alignment and traffic management during construction, if encountered during construction resolving existing liabilities (e.g., contaminate soil), and if any future complementary components to the project coordinating the environmental management (given the types of potential works, such as station enhancements, non-motorized accessibility, multi-modal integration, the environmental impacts should be relatively minor and easily mitigated with standard procedures). OSITRAN is responsible for supervision of environmental health and safety aspects under the concession contract, and is hiring an international consultant firm to support project supervision including environmental health and safety aspects. DGASA was responsible for review and approval of the Project EIA (issuance of environmental permit) and for subsequent supervision of the project environmental permit. The Ministry of Culture is responsible for approving activities involving archeological resources and associated permitting if required. AATE has some existing capacity related to environmental aspects (e.g., with Metro Line 1), which are being supplemented as part of AATE overall plans for project management support. Initial institutional strengthening and coordination activities for AATE have been developed by the Bank and all such measures will be formulized in the Project Operation Manual in conjunction with the other IFIs (see below). OSITRAN has experience in supervision of large construction works and will hire an international consulting firm to assist in the supervision of this Project concession agreement, and the Terms of Reference include reference

to environmental aspects. The Bank has provided OSITRAN ideas to improve the level of effort and technical capacity related to supervision of environmental health and safety aspects in the concession contract.

17. **AATE and OSITRAN responsibilities and capacity building activities will be established in the Project Operation Manual, developed in conjunction among the IFIs (in particular IADB and World Bank).** This will include for AATE: staffing (staff or consultants), supervision of EHS aspects related to the concession contract and IFI requirements, coordination with other Governmental entities, implementation of social communication activities, and coordination and reporting with IFIs. The operation manual will also include procedures for environmental management of project interferences (existing infrastructure interferences such as electrical distribution, water supply and waste water collection, etc. that need to be moved prior to construction) and if needed complementary components to this Project to assess potential impacts and establish necessary mitigation and monitoring measures. The IFIs have recommended that OSITRAN, through the Independent Supervision Consultant, strengthen its supervision capacity of environmental, health and safety (EHS) aspects of the concession contract.

18. **The concessionaire is responsible for Project construction and operation and maintenance environmental health and safety requirements as established under the concession contact.** The concessionaire has been developing and establishing their environmental health and safety team as part of their pre-construction planning and design work. Principal members of the concessionaire consortium have strong experience with environmental health and safety management in metro and large construction projects.

19. **The concession agreement has extensive environmental, health and safety (EHS) requirements**. These include: (i) compliance with all applicable Peruvian regulatory requirements, Project EIA (and ESMP) and the Project environmental permit issued by DGASA; (ii) development and implementation of EHS Management Systems consistent with international standards (ISO 14001, OSHAS 18000); (iii) compliance with IFI environmental requirements established for the Project; (iv) provide EHS training to workers; (v) responsible to obtain any required archeological or cultural resource permits and implement measures to mitigate project impacts on such resources as required by law; (vi) present EHS performance reports on a routing basis; and (vii) maintain insurance in relation to project EHS risks. The associated costs for implementation of these requirements are part of the overall fixed cost for the concession. The concessionaire is responsible to prepare final detail designs for each individual component of the project (e.g., each station, maintenance facility, conventional tunneling, tunneling boring machine tunneling, metro line ventilation points, etc.) and they must be approved by AATE and OSITRAN. Part of the final design document (EDIs in Spanish), includes environmental, health and safety measures which will be established based upon the concessionaire overall EMS and HSMS (see below, and includes the ESMP in Project EIA) and then modified, if needed to reflect an specific characterizes of a given component (e.g., station).

20. **The concessionaire is currently developing their Environmental Management System and Health and Safety Management System consistent with international standards as required in the concession agreement.** These systems will include various plans and are based upon: ESMP in project EIA, recommended measures in the supplemental EIA, listed in concession agreement, being developed by Concessionaire based upon their ideas to establish an effective

system (plans), and additions/modifications identified to meet Equator Principle requirements for the concessionaire private sector financing. The systems will include: staffing and responsibilities, monitoring, training, supervision, and reporting. The concessionaire is also required to undertake specific engineering studies (vibrations, ground water, soil subsidence), and the results from these studies will be used to update, as needed, ESHS systems/plans. The timing for these plans and studies is defined in the concession agreement and the associated costs for implementation are part of the overall fixed cost for the concession. Other related components of these management systems are: Social Communication and Grievance Mechanism, Human Resources which will include relevant labor (worker) aspects; and Procurement/Legal which will include procedure for incorporating EHS aspects into subcontracting and purchase of goods/services.

21. **As part of the Project Operation Manual, which is being developed in conjunction among the IFIs (in particular IADB and World Bank), an Environmental and Social Management Manual (ESMM) summarizes and consolidates the various established environmental and social requirements**. The ESMM includes: (i) the ESMP in the Project EIA; (ii) the ESMP in the Supplemental EIA; (iii) development of the EHS management system components and other applicable concessionaire requirements in the Concession Agreement; (iv) the Resettlement Policy Framework; and (v) AATE and OSITRAN responsibilities and capacity building activities.

22. **The following table is a summary of the disclosure dates for all relevant safeguard instruments:**

Instrument	Disclosure on the World Bank's external website	Disclosure in Country	Comments and link to documents
Environmental Impact Assessment (EIA)	• October 22, 2014 (complete document) • October 22, 2014 (executive summary)	• MTC's Resolution approving the semi-detailed EIA, November 11, 2013 • Disclosure of documents on the PROINVERSION website, April 28, 2014	MTC Resolution: http://www.mtc.gob.pe/transportes/socioambientales/documentos/2013/R.D.%20N%C2%B0%20459-2013-MTC_16.pdf EIA: http://transparencia.mtc.gob.pe/idm_docs/P_recientes/6587.zip http://www.proyectosapp.pe/RepositorioAPS/0/2/JER/LINEA2_TREN/ANEXO_9___EIA.zip
Complementary EIA	November 24, 2014	• MTC's web portal: March 31, 2015	The final draft Complementary EIA was published by DGASA at the following main project website and is subject to further modifications as the project progresses:

			http://www.mtc.gob.pe/transportes/concesiones/ferrovias/sistema_electrico_linea2.html
Resettlement Framework Plan (General PACRI)	As part of Section 10 of the EIA: October 22, 2014 As a separate document: June 17, 2015	• MTC's Resolution approving the PACRI: November 11, 2013 • Disclosure of documents on the PROINVERSION website: April 28, 2014	MTC Resolution: http://www.mtc.gob.pe/transportes/socioambientales/documentos/2013/R.D.%20N°%20459-2013-MTC_16.pdf PACRI (contained within the EIA as Section 10): http://transparencia.mtc.gob.pe/idm_docs/P_recientes/6587.zip http://www.proyectosapp.pe/RepositorioAPS/0/2/JER/LINEA2_TREN/ANEXO_9___EIA.zip
Specific Resettlement Action Plan for Phase 1A (PACRI 1A)	February 11, 2015	• MTC's Resolution approving the PACRI 1A, February 27, 2015 • Disclosure of PACRI 1A on the MTC website: March 10, 2015	http://transparencia.mtc.gob.pe/idm_docs/P_recientes/6556.pdf http://transparencia.mtc.gob.pe/idm_docs/P_recientes/6581.pdf

As of June 2015, the main project website and the current traffic maintenance and management plan are available at the following links:

- http://www.mtc.gob.pe/transportes/concesiones/ferrovias/sistema_electrico_linea2.html
- http://www.aate.gob.pe/desviolinea2/

Annex 5: Implementation Support Plan

PERU: Lima Metro Line 2 Project

Implementation Support Strategy and Approach

1. **The Implementation Support (IS) Strategy considers the risk profile of the Project and aims to improve the sustainability of outcomes.** The challenges involving the investments and reforms needed to successfully implement the Project go beyond the initial investment and construction of Metro Line 2. In coordination with other IFIs, the Bank has initiated a number of activities through donor and trust fund resources[47], including: (i) a one-week international workshop on engineering and construction supervision of Metro Projects delivered in Lima in June 2014; (ii) a one-week international workshop with all stakeholders on the development of an Integration and Accessibility Plan for Metro Line 2 as part of a metro transport strategy in Lima in January 2015; and (iii) a two-day workshop on social and resettlement risks and mitigation in May 2015 in Lima.

2. **The key issues during Project preparation and relevant for Bank implementation support include:** (i) cooperation/coordination between the different levels of government to ensure the needed sector reforms and investments; (ii) institutional strengthening to allow for capacity building within AATE and OSITRAN particularly in participatory planning processes and definition of complementary investments; (iii) full compliance with the safeguard aspects that have been identified in the project preparation.

3. **Implementation Support Plan.** The IS plan for mitigating the most relevant risks is outlined below. The main coordination mechanism for implementation support between the IFIs involved in the Project is a single Operational Manual (OM) to be approved by the GoP. The OM will described supervision and reporting requirements that will be in common for all IFIs in an effort to simplify coordination and ensure information sharing. At least two missions per year are expected to be coordinated with other IFIs, but the frequency of supervision missions is expected to be higher at the beginning of implementation and decrease after the Project reaches a good implementation pace. The IS Plan may be revised periodically on the basis of progress, needs, and available resources.

4. **Mid-Term Review (MTR).** The GoP shall: (a) maintain policies and procedures adequate to enable it to monitor and evaluate on an ongoing basis, in accordance with, the carrying out of the Project and the achievement of the objectives thereof; (b) prepare, under terms of reference satisfactory to the Bank, and furnish to the Bank, 3 months before the planned MTR, a mid-term report

[47] This support includes a PPIAF grant (P125860) Institutional and Technical Support to the Lima Metro Lines 2&4, a PHRD Grant (P129561) on Mainstreaming inclusive design and universal mobility in Lima, and an SFLAC Grant (P153851) for supporting LCR Metro Projects approved in December 2014.

integrating the results of the monitoring and evaluation activities performed pursuant to paragraph (a) of this Section, on the progress achieved in the carrying out of the Project during the period preceding the date of said report and setting out the measures recommended to ensure the efficient carrying out of the Project and the achievement of the objectives thereof during the period following such date; and (c) review with the Bank, by the MTR, or such later date as the Bank shall request, the report referred to in paragraph (b) of this Section, and, thereafter, take all measures required to ensure the efficient completion of the Project and the achievement of the objectives thereof, based on the conclusions and recommendations of the said report and the Bank's views on the matter.

5. **Main implementation focus.** The following table summarizes the main focus of implementation during the life of the Project.

Time	Focus	Resource Estimate	Partner Role
First twelve months	Institutional coordination, and plan for accessibility and integration (tariff, physical and operational)	Sr. urban transport specialist + consultant + workshops	
12-72 months	Implementation of a Metro Transport Strategy	Sr. urban transport specialist + consultants + workshops	
Closing	Project impact ex-post evaluation	Sr. urban transport specialist + consultant + studies	

6. **The following table further details the proposed resources (skill mix, number of staff weeks and trips) required for project implementation.**

Skills Needed	Number of Staff Weeks							Number of Trips						
	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
Task Team Leader	15	10	10	5	5	5	5	2	2	2	2	2	2	2
Sector Specialists and Consultants	30	20	10	5	5	5	5	2	2	2	2	2	2	2
Environmental Specialist(s)	12	10	10	5	5	5	5	2	2	2	2	2	2	2
Social Specialist(s)	12	10	10	5	5	5	5	2	2	2	2	2	2	2
Procurement Specialist	2	2	2	2	2	2	2	1	1	1	1	1	1	1

Financial Management Specialist	5	2	2	2	2	2	2	2	2	2	2	2	2	2
Disbursement Specialist	2	2	2	2	2	2	2							
Communications Specialist	2	2	2	2	2	2	2	1	1	1	1	1	1	1
Local focal point (WB Peru Office)	4	4	4	2	2	2	2							
Operations Analyst/JPA	10	10	10	5	5	5	5	2	2	2	2	2	2	2

Annex 6: Economic and Financial Analysis

PERU: Lima Metro Line 2 Project

Part I: Economic Analysis

A. Introduction

1. This annex presents the results of the economic evaluation for the proposed investment project involving the construction and operation of Line 2 and a branch of Line 4 of the Lima Metro (the Project). The economic analysis shows that the Project is economically viable. The evaluation horizon is 30 years, with capital investments in the first six years and partial operations starting in year 3. Over this period, and under the base scenario of demand, the Project is expected to yield an Economic Internal Rate of Return (EIRR) of almost 9 percent. The EIRR is defined as the rate at which the discounted costs and benefits over the life of the Project are equal.

2. As presented in Table 1, the Lima Metropolitan Region (LMR) currently has a population of over 9 million inhabitants and concentrates about 4.8 million formal jobs. Population in the LMR is expected to grow at an average rate of approximately 1.6 percent over the next fifteen years, increasing to 12 million by 2030. At the same time, the number of jobs in the LMR is expected to grow at 2.3 percent per annum until 2025 and to continue increasing at a faster pace of 2.7 percent per year from 2025 to 2030, when this growth will moderate slightly. Although the national and municipal governments are trying to encourage a reduction in private vehicle use through investments in better public transport, economic growth is still expected to drive a significant increase in the automobile fleet, which is expected to grow by nearly 40 percent over the next fifteen years. These are reasonable assumptions and consistent with recent trends in Lima as the primary city in Peru attracting population and economic activity.

Table 1: Socio-economic assumptions of the Study Area

Socioeconomic Indicators	2012	2015	Yearly Growth	2025	Yearly Growth	2030	Yearly Growth
Population	9,450,585	9,904,727	1.60%	11,444,682	1.50%	12,083,190	1.10%
Jobs	4,788,122	5,124,164	2.30%	6,663,153	2.70%	7,355,13	2.00%
Enrollment	2,796,383	2,908,392	1.30%	3,476,265	1.80%	3,717,277	1.30%
Auto Fleet	647,796	733,284	4.20%	932,814	2.40%	1,021,195	1.80%

Source: Metro Line 2 Feasibility Study

3. Lima operates a complex public transport system ranging from informal jitneys and microbuses to more formal systems served by standard buses and microbuses, articulated and high-capacity buses (BRT) and urban trains (Line 1). As shown in Table 2, the vast majority of vehicle-kilometers are on informal modes and studies have repeatedly called for more formalized high-capacity services with truck-feeder operation.

Table 2 : Vehicle-Km/Day by Public Transport Mode in Year 2012

1	Jitneys (Camioneta Rural)	2,287,477	47.86%
2	Microbus	1,861,552	38.95%
3	Bus Standard	541,025	11.32%
4	BRT (Metropolitano I - COSAC)	44,252	0.93%
5	BRT Feeder System	41,785	0.87%
6	Rail - Line 1 (Tren Eléctrico)	2,929	0.06%
	Total Public Transport	4,779,019	100.00%

Source: Metro Line 2 Transport Model (Consorcio GEODATA-SERCONSULT-ESAN)

4. The Government has long envisioned a substantial urban rail/metro and BRT network to upgrade both the capacity and service quality of its public transport system: the future metro network (as pictured in Annex 8) will consist of 5 lines stretching over 168 km and including 135 stations (*Decreto Supremo 059-2010-MTC*, dated December 23, 2010). These lines will be supported by the *Metropolitano BRT and* extensive feeder bus service which will be expanded by the municipal government of Lima. Metro Line 1 (also known as the *"Tren Electrico"*) started partial operations in 2010, nearly 30 years after its original procurement. Currently, Metro Line 2 is a key priority for the Government as the first high-capacity transit system connecting the LMR from East to West.

5. The feasibility study approved by MTC selected the most viable alternative among 5 underground horizontal alignments in the middle section of the Project, but did not consider explicitly other alternatives in terms of corridor alignment, vertical alignment (at grade or elevated), and technology/mode (light rail or BRT). A high-level decision to design an all-underground rail alignment for Line 2 including the Line 4 Branch to the airport was taken by the GoP before the involvement of the World Bank. The feasibility study estimated the potential demand at around 660,000 passengers per day once the entire 35km Project is operational (not expected before the year 2020). The Bank made a thorough review of the feasibility study and focused on the incremental costs and benefits of additional options such as a reduced length of Project and a reduced number of stations.

B. Demand Forecasts

6. The Bank carried out a thorough and independent review of the demand study approved by Proinversion, as well as of other supporting studies (listed under the references) with a view towards ensuring that the Project will produce the expected benefits. The demand study assumes the future integration with at least 130.6 kms of interconnected high-capacity lines and feeder services, per Table 3. Proinversion's demand model assumed Line 2 running approximate 28 km along an east-west axis through the center of Lima, intersecting with the existing Line 1 at 28 de Julio Station, with Line 3 at Central Station and with Line 4 at San Jose Station. There will also be a number of interchanges with bus corridor services along the route. Metro stops will be provided at an average spacing of 1 km and fares are planned to be integrated with the bus network.

7. Demand forecasts were prepared using a TRANSCAD traffic model prepared by the consultants hired by Proinversion to structure the Project (Consortium GEODATA-SERCONSULT-ESAN). An all-day model with 159 zones representing the Lima Metropolitan area was used with a focus on the area of influence for Lines 2 and 4 (see Figure 1). This model was developed using data from a 20,000 household survey carried out in 2004 with the support of JICA, as well as data from a 2011 complementary roadside/boarding survey (*Estudio de Toma de Datos*, carried out by consultancy Taryet). The latter study contains highway and transit data including busway route networks.

Table 3 – Line 2 Interconnections and Feeder System

ALT	RUTA	INTERCONEXIONES	LONG. (KM)
1	BRASIL-GRAU-NICOLAS AYLLON-RIVA AGÜERO – PIRAMIDE DEL SOL Var: Carretera Central y Separador Industrial	Líneas: 1 (2), 2 (2) COSAC: 1	16 + 9.7
2	UNIVERSITARIA – EL NARANJAL Var: Continuar por Panamericana Norte – Línea Azul	Líneas: 2, 3, 4 COSAC: 1	13.8 + 13.5
3	ANGAMOS – EL EJERCITO	Líneas: 1, 3 COSAC: 1, Alt-1	18.2
4	JAVIER PRADO (JOCKEY PLAZA – AV.BRASIL)	Líneas: 1, 3, 4 COSAC: 1, Alt-1	9.9
5	ESTACION CENTRAL – AV. ARGENTINA	Líneas: 2 (2), 3, 4 COSAC: 1, Alt-1	15.7
6	PANAM. SUR – EVITAMIENTO- ZARUMILLA – JOSE GRANDA – LOS DOMINICOS – EL NARANJAL	Líneas: 1 (2), 3, 4 COSAC: 1 (2), Alt-1, Alt-4	34
		TOTAL	130.6

Source: Proinversion's Demand Model

8. The traffic model followed the standard four-step approach to forecasting demand for the new investment including:

- Trip Generation for each typical period of the day (AM Peak, Between Peaks and PM Peak) employing multivariate analysis on socio-economic zonal data of population, jobs, school enrollment and car fleet.
- Trip Distribution through the application of a gravity model estimated according to the distance between zones reflected by a generalized cost measure.
- Modal choice was calculated through a multi-linear regression model correlating ratio of vehicle ownership and private/public ratios of cost and time.
- Trip assignment was calculated through a capacity restraint algorithm, which iterates to achieve balanced loadings for feasible routes. Nonetheless, public transport assignment was allocated in an all-or-nothing basis with no consideration for passenger capacity constraint.

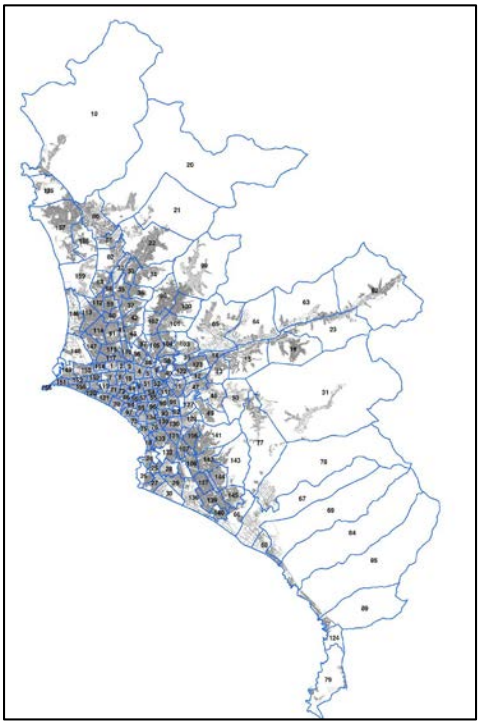
9. Although Proinversion's model covered all the issues related to transport demand and supply planning, it was somewhat limited in terms of modal choice between different public transport modes and the impact of fares on modal choice. Therefore, this model could only provide an approximation of the output-data required to evaluate issues that were critical for evaluation. Additionally, Proinversion's model included assumptions associated with the relationship between the increased accessibility offered by the new rail line and new demand that results in a considerable level of new induced demand in the "with project" scenario. While there is agreement among experts that some induced demand can be realized, it is difficult to forecast accurately for

'greenfield' projects. A conservative analysis would not include significant induced demand at this stage.

10. As part of project appraisal, and due to these methodological differences, the Bank carried out independent forecasts using an econometrical discrete choice model. The model runs on the demand set defined by the select-link-analysis of the potential demand provided by Proinversion's Consultant. This model includes standard conservative assumptions that do not consider significant induced demand. In addition, the model has greater sensitivity to the difference in fares for different public transport services and associated impact of modal competition. Lastly, the model enables a better representation of mode choice and the impact of the Project on the different modes.

11. The model applied by the Bank has the same 159 zones, covering the entire area of influence of both Line 2 and of the Line 4 Branch. The base inter-zonal public transport trips for 2020 were derived from the Consultants' TRANSCAD model. The network times and costs were derived from zonal geo-referenced distances and equations extracted from an additional road-side and embarked survey. The model estimates the average value of time at 1.47 Soles per hour, which corresponds approximately to 1/3 of the Minimum Salary hourly rate in 2012 (see Table 4). The value of time is conservatively assumed to remain constant over the estimation period, although incomes are expected to continue rising.[48]

Figure 1: Lima Study Area Zoning



[48] The user population of Metro is also likely to change over time as more people buy private vehicles and relocate within the LMR, so a constant value of time is conservatively assumed.

Table 4: Estimated Value of Time (VoT) for Railway Users – year 2012

Value of Time	VoT Soles/Hr
Average	1.47
Higher Threshold (95%)	1.98
Lower Threshold (95%)	0.97
Minimum hourly salary (Soles)	4.36

Source: World Bank analysis based on Proinversion's Transport Model

12. The share of total trips using the Metro Line 2 and branch of Line 4 was then derived using a conditional logit model in which transit trips were split between formal and informal bus systems and Metro. Three scenarios were simulated according to different levels of modal integration:

- Optimistic – Consistent with the Government-approved Feasibility Study and modeled by Proinversion's Consultants, this scenario assumes full multi-modal integration (physical, tariff, operational in a Trunk-Feeder configuration), complementary policies and interventions to the concession contract, and 'gravity effects' (induced demand based on population and job distribution over time).
- Base Scenario – Assumes minimal levels of induced demand based on the contractually required levels of modal integration for the Project (principally with Metro Line 1 and *Metropolitano* BRT), the existence of formal bus system but not fully integrated, and an informal public transport system competes directly with the Feeder/Trunk services.
- Pessimistic – Assumes no induced demand and the conventional public transport system competes directly with the Project. No integration policy between formal modes and no regulations of informal modes exists.

13. The Bank's base ridership for the Project is expected to be about 360,000 passengers per day. A number of sensitivity tests were undertaken examining ridership under the above-mentioned scenarios and the results are summarized in Table 5. The Project investments, operating costs, benefits and economic evaluation were calculated using the Base Scenario. The trip distances calculated for the metro system are on average 10 percent above existing systems as would be expected in Metro+Feeder scheme. Walking times and waiting times for integration are compensated by higher in-vehicle speeds, per Table 6.

Table 5: Daily Demand Forecasts for Metro Line 2+Line 4 Branch (passengers/day)

Demand Scenarios	Year 2020
Optimistic	678,746
Base	360,682
Pessimistic	162,393

Source: World Bank estimates

Table 6: Model Estimates for Public System Performance

Network Attributes	Metro+Feeder	Formal Bus + Microbus	Informal Micro
In-vehicle Speed (Km/h)	43.9	32.1	27.8
Distance (km)	22.4	20.8	20.8

Source: World Bank estimates

C. Project Investment

14. Table 7 is an estimate of the investment flows for CAPEX based on the Concession Contract awarded by Proinversion. The estimated economic cost of capital of the project at 2014 prices is approximately US$4.946 billion of which: US$4.012 billion for civil works, US$519 million for rolling stock and US$414 million for expropriations and interferences. For the purposes of economic analysis, all input costs are assumed to be exempt of taxes estimated to be 18 percent.

Table 7: Economic Investments for CAPEX (million US$, excludes taxes)

Cost Categories	GoP (US$ Million)	Concessionaire (US$ Million)	Total (US$ Million)
Civil Works and all systems	2,727	1,285	4,012
Expropriation costs	414	0	414
Rolling Stock	404	115	519
TOTAL	3,546	1,400	4,946

Source: Estimates based on Concession Contract

15. The analysis assumes a horizon of 30 years and a residual value of 10 percent of the investment in rolling stock after 25 years of usage. A total of 252 rail vehicles are planned for operation as presented in Table 8. It has been assumed that none of the train-sets will need to be renewed during the 30-year evaluation period. Residual values have been derived based on straight-line depreciation over the assumed asset lives.

Table 8: Operating Fleet Evolution

YEAR	Vehicles Operating	Vehicles in Reserve	Totals
2016	18	12	30
2018	102	18	120
2019	204	48	252

Source: Estimates based on Concession Contract

D. Economic Benefits

16. The benefits of the Project fall into three main categories:

- **Change in consumer surplus for passengers in the area of influence of the Project[49]:** This category includes the travel time savings net of any change in fares, together with any changes in accessibility, transfers, headways, convenience and service frequencies. On average, the project will save the typical user in the corridor served by the Project about 34 percent of the time that it currently takes to complete the journey with the existing services. This has been estimated through the marginal utility of income and time of the Conditional Logit Model over a sample of 8,604 business and non-business travel choices. The choice model application utilized the Project's selected-link analysis OD set provided by Proinversion's consultant. The scaled up results in the AM Peak hour are used to estimate daily and yearly benefits and costs for 310 equivalent operational days per year. This category represents the vast majority (95 percent) of the estimated Project benefits.
- **Changes in the operating costs of urban transport**: This is a minor category relates to potential cost savings from replacing the urban bus services and associated road maintenance costs by operating Line 2/Line 4 assuming the migration of passengers from current bus and microbus services to the new metro service and associated reduction in bus vehicle-km on the roads of LMR.
- **Changes in externalities of the urban transport system:** The expected reductions in road vehicle-km by various modes should impact the number of accidents, air pollution, greenhouse gases, and other social externalities. The externalities that can be quantified and monetized are estimated by calculating physical changes in each of these impacts (e.g. changes in the volume of GHG emissions) multiplied by estimated unit costs from available sources. These changes have been identified in five groups:
    - Accident benefits due to reduced travel on the surface street network[50];
    - Local air pollution benefits from the reduction in bus traffic;
    - Greenhouse gas benefits due to the reduction in vehicles powered by fossil fuels: it was estimated that the Project would save between 30,000 and 50,000 tons per year of CO^2-equivalent during the evaluation period under the base demand scenario.[51]
    - Congestion benefits for other road users.

17. All of the above benefits are quantifiable and were used in the economic analysis. There are, however, a number of non-quantifiable benefits which were not captured in the cost-benefit analysis but are worth noting nonetheless:

[49] The consumer surplus methodology used here is based on recent transport economics literature, including McFadden (2000) and De Jong et al. (2005), to estimate "willingness-to-pay" for improved services from existing travel surveys. Traditional methods for valuating benefits (primarily total travel time savings) typically underestimate other, intangible benefits (such as improved accessibility, comfort and convenience from more frequent and reliable services) and may yield a lower Project EIRR.

[50] The unit costs for accidents and local air pollution have been derived from Latin America cities per CAF (2010).

[51] The emissions estimates are based on a methodology consistent with the World Bank's GHG Transport Accounting Tool. A value of US$35 to US$80 per metric ton of CO_2-equivalent was used during the evaluation period based on the 2014 World Bank Guidance note on the "Social Value of Carbon for Project Appraisal."

- **Accessibility:** The Project will promote interconnections between residential and employment areas and social facilities (hospitals, schools) by lowering the obstacles to travel within the city. Although the economic evaluation quantifies improvement in travel time savings, it does not directly quantify the associated private benefits of this increased accessibility for residents of Lima, such as increased social-economic opportunities for all of Lima's residents or increased land values near metro stations.
- **Compact City Growth:** One of the opportunities for Lima's planned metro system is to focus urban growth and land use policies along an upgraded public transport network. Over many years, this strategy may be able to substantially reduce the intensity of energy consumption and greenhouse gas emissions of urban areas, but these long-term secondary impacts are not quantifiable in a traditional cost-benefit analysis.

E. Economic Rate of Return and Sensitivity Analyses

18. The net project benefits were calculated for the 30-year period (2015 to 2045) and the resulting EIRR was estimated at 8.9 percent with a NPV of about US$459 million. The sensitivity of this EIRR to changes in the base scenario assumptions was tested as shown in Table 9:

- Annual demand (ridership) growth rates of 2 percent to 5 percent, representing the level of induced demand and changes in overall travel patterns in Metropolitan Lima, can have a considerable impact on the EIRR;
- A project delay has a relatively minor impact.
- Excluding external benefits has a relatively minor impact on the EIRR;
- Excluding operating cost savings has a relatively minor impact on the EIRR.
- As expected, travel time savings are the majority of the estimated consumer benefits.

Table 9: Sensitivity of project evaluation

	Test	EIRR (percent)
1	Base Assumptions (annual growth rate =3.5%)	8.9
2	Base with two-year Project delay	8.8
3	Lower Demand Growth Rate = 2%	7.6
4	Higher Demand Growth Rate = 5%	10.1
5	Base, Excluding external benefits	8.7
6	Base, Excluding operating cost savings	8.5
7	Base, Travel time saving only	6.6

Source: World Bank Analysis

19. The Bank also carried out a switching value analysis to assess the sensitivity of the evaluation results to changes in the key variables. Switching values are presented in terms of the percentage change needed in the value of the variable to turn the project's NPV equal to zero. Table 10 presents the results of this analysis at various discount rates. In the past, Bank infrastructure projects often assumed a 12 percent discount rate, but a much lower rate between 4 percent and 8 percent has been observed recently for large public transportation projects with long-

lived benefits.[52] A recent World Bank study also suggests lower discount rates for investment projects with similar characteristics in Peru and other countries of the region because social benefits materialize over the long-run.[53] Moreover, it is not possible to quantify all positive externalities from this Project, particularly as it is the initial section of a larger transport network with long-term benefits and possible spill-over effects. For these reasons, a discount rate of 6 percent was deemed appropriate for the sensitivity analysis.

20. Assuming a discount rate of 6 percent, the Project could sustain a positive NPV (thus economic feasibility) with an increase of up to 45 percent of CAPEX or a decrease in consumer benefits of up to 14 percent. At a discount rate of 10 percent, consumer benefits would have to increase by 11 percent or CAPEX decrease by 12 percent to reach a positive NPV.

Table 10: Switching Value Analysis at a Various Discount Rates

Discount rate:	6%	9%	10%	12%
CAPEX	+45%	-1.6%	-12%	-29%
OPEX	+186%	-9.0%	-78%	-100%
Consumer Benefit	-29%	+0.2%	+11%	+35%

Source: World Bank Analysis

21. The project economic flows for the Base scenarios of demand (360,000 passengers per day) and annual demand growth (3.5 percent) are presented in Table 11.

[52] A recent review specific to urban rail projects in New York, London and Toronto completed since 2000 revealed that these projects have used rates varying between 2.35% and 5%. Similarly results are shown in a study for a set of metro projects in a few OECD countries. Chile is currently using a discount rate of 7% for all infrastructure projects.
[53] A recent publication estimated a social discount rate for Peru ranging between 4.1 and 6.7 percent depending on future growth scenarios for the country (Lopez, Humberto, "The Social Discount Rate: Estimates for Nine Latin American Countries", Policy Research Working Paper 4639, World Bank, 2008).

Table 11: World Bank Cost-Benefit Estimate for Base Scenario of Demand (in US$ '000)

Year	Investment Costs	Operation Costs	Total Benefits	B-C
2013	-			-
2014	395,762.71			(395,762.71)
2015	939,830.51			(939,830.51)
2016	1,138,135.59	8,787.92		(1,146,923.51)
2017	1,186,440.68	13,181.88		(1,199,622.56)
2018	988,983.05	44,818.40	401,878.72	(631,922.72)
2019	296,610.17	68,545.78	426,348.16	61,192.21
2020	-	92,273.17	452,306.60	360,033.43
2021		92,273.17	468,183.89	375,910.72
2022		92,273.17	484,618.51	392,345.34
2023		92,273.17	501,630.03	409,356.86
2024		92,273.17	519,238.69	426,965.52
2025		92,273.17	537,465.47	445,192.30
2026		92,273.17	556,332.05	464,058.88
2027		92,273.17	575,860.90	483,587.73
2028		92,273.17	596,075.26	503,802.09
2029		92,273.17	616,999.19	524,726.02
2030		92,273.17	638,657.61	546,384.44
2031		92,273.17	661,076.30	568,803.13
2032		92,273.17	684,281.94	592,008.77
2033		92,273.17	708,302.15	616,028.98
2034		92,273.17	733,165.53	640,892.36
2035		92,273.17	758,901.68	666,628.51
2036		92,273.17	785,541.23	693,268.06
2037		92,273.17	813,115.90	720,842.73
2038		92,273.17	841,658.51	749,385.34
2039		92,273.17	871,203.03	778,929.86
2040		92,273.17	901,784.63	809,511.46
2041		92,273.17	933,439.73	841,166.56
2042		92,273.17	966,205.99	873,932.82
2043		92,273.17	1,000,122.43	907,849.26
2044		92,273.17	1,035,229.42	942,956.25
2045		92,273.17	1,071,568.74	979,295.57
2046		92,273.17	1,109,183.67	1,016,910.50
2047		92,273.17	1,148,118.96	1,055,845.79
2048	(60,768.00)	30,757.72	1,117,093.92	1,147,104.19
	4,884,994.71	2,749,740.46	22,915,588.82	15,280,853.65
			EIRR %	8.9%

Part II: Financial Analysis

A. Background

1. The Project will be built and operated by a Project Company structured as a Special Purpose Vehicle (the Concessionaire) and owned by the companies in the winning consortium. The Project Company will be responsible for implementing the project, and mobilizing and repaying the project financing under the terms of the Concession Agreement. Rather than evaluating the financial returns to the shareholders in the Project Company, the financial analysis presented in this section focuses on assessing the financial viability of the Project from the perspective of the implementing agency or Metro Company. The analysis consists of the estimation of the Project's expected cash inflows and outflows over time and the evaluation of whether the Project generates a sufficient cash to meet its capital investment and operational expenditure obligations.

B. Cash Inflows

2. The overwhelming share of cash inflows will be earned from passenger fare revenues, either directly or allocated to it through revenue settlements. The Concession agreement states that Line 2 is expected to charge a regular tariff of US$0.75 during operation of the first phase (Etapa 1A), reaching US$1.00 (approximately 3 Soles at the current exchange rate) once the entire line is in operation (around 2020). This is higher than the current average fare for the bus network of 1.50 to 2 Soles per passenger (approximately US$0.50 to 0.67) but is close to the mean metro fare of several Latin America cities per Table 12. Conservatively, revenue from other sources (station advertising, rental of commercial spaces, associated development etc.) was not considered in this analysis although it can typically be 5-15percent of revenues.

Table 12 – Base Metro Fares

City	US$
Buenos Aires	0.22
Caracas	0.23
Ciudad de Mexico	0.18
Rio de Janeiro	1.45
Santiago	0.62
São Paulo	1.28

Source: "Observatorio de Movilidad Urbana para América Latina", CAF, 2010.

C. Cash Outflows

3. Cash outflows consist of the project capital investment outlays and operating costs based on the Project's feasibility study and Concessionaire's financial proposal (including taxes of around 18 percent). Of the total estimated US$5.836 billion investment for the Project, the GoP's

contributions during construction is estimated at around US$4.184 billion including US$3.218 billion for civil works, US$477 million for rolling stock and US$489 million for expropriations and interferences, as presented in Table 13.

Table 13 – Project Financial Outflows (including taxes)

Cost Categories	GoP (US$ Million)	Concessionaire (US$ Million)	Total (US$ Million)
Civil Works and all systems	3,218	1,516	4,734
Expropriation costs	489		489
Civil Works and all systems	477	136	613
TOTAL	**4,184**	**1,652**	**5,836**

D. Financial Rate of Return

4. As presented in Table 13, the Financial Internal Rate of Return (FIRR) is estimated to be -3.9 percent over the 2015-2048 evaluation period and assuming a base fare of US$1 (once Line 2 is fully operational per the Concession agreement), a base demand of 360,000 passenger/day in 2020 and base demand growth of 3.5 percent per year. This result is a reflection of the very substantial initial capital costs and the fact that fare revenues only begin to be collected after roughly 3 years of construction. The project is cash-positive after 2020 and passenger fare revenues exceed operational costs during the evaluation period. However, the capital investment cannot be recovered from fare revenues during the evaluation period and the negative FIRR suggests that fare revenues would needed to be supplemented by public subsidies or other revenues to reach a positive FIRR under the base demand assumptions. This is typical for a major public infrastructure investment project. The burden on Government can be reduced by ensure that demand is maximized to achieve the highest economic and financial return on this major investment.

Table 14: Incremental Costs and Revenues assuming USD 1 Fare (in US$ '000)

Year	CAPEX	OPEX	Fare Revenue	Undiscounted Cash Flow
2013	-	0	0	-
2014	467,000.00	0	0	(467,000.00)
2015	1,109,000.00	0	0	(1,109,000.00)
2016	1,343,000.00	10,369.75	0	(1,353,369.75)
2017	1,400,000.00	15,554.62	0	(1,415,554.62)
2018	1,167,000.00	52,885.71	104,401.91	(1,115,483.80)
2019	350,000.00	80,884.02	110,757.38	(320,126.65)
2020	-	108,882.34	117,499.73	8,617.39
2021		108,882.34	121,612.22	12,729.88
2022		108,882.34	125,868.65	16,986.31
2023		108,882.34	130,274.06	21,391.71
2024		108,882.34	134,833.65	25,951.31
2025		108,882.34	139,552.82	30,670.48
2026		108,882.34	144,437.17	35,554.83
2027		108,882.34	149,492.47	40,610.13
2028		108,882.34	154,724.71	45,842.37
2029		108,882.34	160,140.08	51,257.74
2030		108,882.34	165,744.98	56,862.64
2031		108,882.34	171,546.05	62,663.71
2032		108,882.34	177,550.17	68,667.82
2033		108,882.34	183,764.42	74,882.08
2034		108,882.34	190,196.18	81,313.84
2035		108,882.34	196,853.04	87,970.70
2036		108,882.34	203,742.90	94,860.56
2037		108,882.34	210,873.90	101,991.56
2038		108,882.34	218,254.49	109,372.15
2039		108,882.34	225,893.39	117,011.05
2040		108,882.34	233,799.66	124,917.32
2041		108,882.34	241,982.65	133,100.31
2042		108,882.34	250,452.04	141,569.70
2043		108,882.34	259,217.86	150,335.52
2044		108,882.34	268,290.49	159,408.15
2045		108,882.34	277,680.66	168,798.32
2046		108,882.34	287,399.48	178,517.14
2047		108,882.34	297,458.46	188,576.12
2048	(71,706.24)	36,294.11	297,458.46	332,870.59
	5,764,293.76	3,244,693.75	5,951,754.15	(3,057,233.35)
			FIRR %	-3.9%

5. Under the base demand assumptions and without considering the cost of borrowing, the financial analysis suggests that a fare of 4.8 Soles (about US$1.60) would result in an FIRR of zero, meaning that the Project is able to cover all capital and operating costs over the evaluation period. Financial rates of return vary from 2.7 percent assuming a fare of 7 Soles (about US$2.33) to -7.6 percent assuming a fare of 2 Soles (about US$0.66). The Bank's independent analysis of the demand study suggests that the base demand scenario is relatively inelastic to the fare level. The price-demand sensitivity analysis in Table 15 indicates that a fare of 4.8 Soles would attract a demand of about 344,000 passengers. This number is only 4 percent below the 2020 demand level estimated for the base scenario of the economic analysis.

Table 15: Price-demand elasticity analysis

Base Fare (in Soles)	Daily demand	Price elasticity	FIRR
7	338,420	-0.00944	2.70%
6	340,720	-0.00366	1.50%
5	343,430	-0.00434	0.20%
4	346,731	-0.00534	-1.50%
3	350,956	-0.00696	-3.80%
2	356,838	-0.01006	-7.60%
1	366,625	-0.01828	N. A.

Source: Own Analysis

6. The financial analysis suggests that the FIRR turns positive at a fare above 4.7 Soles (about US$1.57), but the issues of subsidies and affordability to low-income users are critical for fare setting and tariff policy. Considering a fare of 3 Soles, public subsidies would be needed to cover about one-third of the Project's costs.

Part III: Fiscal Sustainability

1. Peru has adopted a solid fiscal policy that has allowed for continuous fiscal surpluses.[54] Despite a less favorable economic environment, the Multi-Annual Fiscal Framework for 2015-2017 still shows compliance with the structural deficit target for the non-financial public sector. In addition, the same medium-term framework projects that the ratio of public debt to GDP will continue to decrease and reach about 17.7 percent in 2017, lower than the ratio for other countries in the Latin America Region.

2. The GoP is adopting a countercyclical policy to face the deceleration in its economy and it is planning to significantly ramp up public expenditure. The non-financial expenditures of the entire government are expected to grow at a real rate of 6.8 percent between 2013 and 2017 reaching 22 percent of GDP in that year. In 2014, the GoP, through Proinversion, awarded 15 new PPP projects for an amount of US$11.3 billion (excluding VAT), 2.5 times more than the previous year and 6.4 times the average annual investments awarded in the 2006 to 2013 period. Between 2015 and 2017, it is expected that about US$6.5 billion in new PPP projects will awarded annually. Despite the marked increase in public investment, the GoP believes to be in a reasonable fiscal position to take on this large commitment supported by sustained economic growth in the past six years.[55]

Fiscal Impact of the Project

3. The Lima Metro Line 2 Project will require substantial contributions from the GoP budget throughout the entire concession period. The GoP has undertaken the following fiscal commitments related to the Project: (i) fund expropriation and project interferences in an amount of US$490 million; (ii) co-finance capital investments in civil works and rolling stock (in the form of PPO and PPMR payments) during the construction period for an amount of approximately US$3.7 billion (US$3 billion excluding VAT); (iii) remunerate the private concessionaire capital investment for a period of 15 years following the start of operations of the second phase (through RPI and RPI-MR payments) totaling approximately US$1.7 billion (US$1.4 billion excluding VAT); and (iv) pay approximately US$109 million per year (in the form of the RPMO payment) for operations and maintenance once the project is fully operational, regardless of the number of passengers transported. The nominal total public capital investment in the Project amounts to approximately 3 percent of the country's GDP in 2013.

4. According to the latest medium term projections produced by the Ministry of Finance (MEF), between 2014 and 2017, the capital investment of the General Government (comprised of the Central and local government entities) in PPPs is expected to average approximately US$2 billion per year, of which about US$0.9 billion will go to the Project (48 percent). On average, the annual investment in the project will represent 6 percent of the Government's total capital expenditures from 2014 to 2017.

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[54] World Bank Country Partnership Strategy for the Republic of Peru FY12-FY16: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/02/21/000356161_20120221225314/Rendered/PDF/661870CAS0R2010Official0Use0Only090.pdf and *Marco Macroeconómico Multianual* 2015-2017, *Ministerio de Economia y Finanzas* (http://www.mef.gob.pe/contenidos/pol_econ/marco_macro/mmm_2015_2017.pdf).

[55] http://data.worldbank.org/country/peru

Table 16: Capital Expenditures of the Government of Peru (Central and Local Governments) 2013-2017 (US$ million)

	2013	2014	2015	2016	2017	Average 2014-2017
Capital Investment in the Project*	-	636	994	1,033	988	913
Investment in Project as a % of Total Investment in PPPs	0%	55%	42%	42%	51%	48%
Investment in PPPs	674	1,149	2,369	2,465	1,941	1,981
Investment in Public Works	10,361	10,701	11,031	12,799	15,229	12,440
Other Capital Expenditures	911	1,124	1,756	1,856	2,023	1,690
Investment in Project as a % of Total Capital Investment	0%	5%	7%	6%	5%	6%
Total Capital Expenditures of the Government	11,946	12,974	15,157	17,120	19,192	16,111
Total firm and contingent commitments for all PPPs		1,902	2,881	2,996	2,865	2,688

**Capital Investment in the Project corresponds to the sum of PPO, PPMR and costs associated with the removal of interferences and expropriations, assumed by the Government. These projections may be different to those in the Project cost table given exchange rate differences.*

Source: Own elaboration based on Revised Multi-Annual Macroeconomic Framework for the Republic of Peru, Ministry of Finance, August 24, 2014

5. According to the current project schedule (for which investments start in 2015 following the delays in the initiation of the works), it is estimated that the Project would lead to an additional public expenditure of an estimated 0.4 percent of GDP annually, over the next four years (2015-2018), corresponding to a total of 1.9 percent of GDP.

6. Base case projections show that once operational, Project revenues will be sufficient to cover Operation and Maintenance (O&M) expenditures. The RPMO payment in 2016 and 2017, the first two partial years of operation, is expected to be US$29.6 million and 34.1 million, respectively. In terms of the fiscal commitments during operations, the full RPMO payment of US$109 million per year is equivalent to about 21 percent of the projected average annual O&M payments for all PPPs of the Non-financial Public Sector in the 2013-2017 period.

Fiscal Sustainability

7. In 2013, MEF approved the Project following a detailed evaluation that looked at the Project's fiscal impact and sustainability (*Informe Técnico N° 064-2013-EF/63.01*) and later ratified by the GoP's Accountability Office. MEF's evaluation as published through their public investment system (SNIP) indicated that the choice of a vertically integrated PPP generated value for money for the public sector and optimized the use of public funds.[56]

[56] For more information, please see:
http://ofi2.mef.gob.pe/bp/ConsultarPIP/frmConsultarPIP.asp?accion=consultar&txtCodigo=239307

8. Peru's solid macroeconomic and fiscal stance would not be jeopardized by the absorption of the required investment. The current debt/GDP ratio is below 20 percent, the general government deficit stands at 0.1 percent of GDP, there is an amount equivalent of about 4 percent of GDP in the Fiscal Stabilization Fund, and Peru has a sovereign investment grade rating.

9. The Government's ability to comply with the requirements set by the Law to Strengthen Fiscal Responsibility and Transparency (No. 300099 of October 2013) is not expected to be put at risk by the implementation of the Project. For the period 2015-2017, this law stipulates a structural deficit not exceeding 1 percent. The structural deficit in 2013 amounted to 0.7 percent of GDP. The proximity to the threshold implies a risk that it could be bridged under certain scenarios. Trend projections indicate that the additional outlays for the Project should not lead to a bridging of the threshold in 2015 by itself, although of course this is vulnerable to certain macroeconomic scenarios (extent of slowdown and fall in commodity prices, implications of tax reform announced in December 2014). For the outer years, there would be more time for an adjustment to ensure that the Law is complied with. The fiscal rule of 1 percent of structural deficit is indicative and there are no prescribed remedies in case it is bridged. If the MEF believes that the limit is likely to be breached in a given year, it can go to Congress to explain the reason and ask for a waiver.

10. PPPs are also developed within a fiscal responsibility framework monitored closely by MEF. Specifically, there is a rule (at the level of a legislative decree) that defines a limit for the fiscal commitments that the Government can make as part of PPPs: The accumulated stock of firm and contingent commitments, net of revenues, assumed by the Non-Financial Public Sector as part of PPP contracts cannot exceed 7 percent of GDP on a present value basis. The fiscal commitments limit can be revised every three years (Article 13 of Legislative Decree 1012). MEF estimates the current consumption of the above-mentioned limit at approximately 4 percent of GDP and forecasts that after including the Project and assuming the successful award of all PPP projects in the pipeline, there would still be 'headroom' within this ceiling of at least 1 percent of GDP.

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Annex 7: Accessibility Analysis and the Potential Impact on Reducing Poverty and Boosting Shared Prosperity

PERU: Lima Metro Line 2 Project

1. This annex provides a summary of the Project's three dimensions of enhanced accessibility that are expected to help reduce income-based inequalities and spatial mismatches for the area of influence of Metro Line 2, and ultimately contribute to reducing poverty and boosting shared prosperity in the LMR.

2. First, a regional accessibility analysis illustrates the potential of the Project to increase accessibility to economic and social opportunities (i.e., job markets, hospitals, universities, malls and cultural venues such as libraries and museums) in the region to the bottom 40 percent of Lima's population. Disaggregated data from existing travel surveys suggests that at present many of these opportunities are just not accessible to those living in the region's periphery, especially in the eastern periphery. This analysis will help identify the potential Project benefits and the affordability implications of the system especially in peripheral urban areas where the poor tend to live.

3. Second, a local accessibility analysis is presented for the direct area of influence where future Metro Line 2 stations will have the potential to improve the living conditions of the poor by transforming the built environment of surrounding neighborhoods as part of a Multimodal Integration and Accessibility Plan. The analysis focuses on local access of amenities and services associated to broader local economic development opportunities and social benefits. Generally, low-income neighborhoods in the periphery districts are not characterized by mixed-use development and have a low job-housing balance. They also lack local access to other urban amenities associated to livable and vibrant neighborhoods, such as high-quality public open (green) spaces and facilities for education, health and groceries. Local access to these amenities and services are compared across the 13 districts of the direct area of influence and against the LMR average. The gap on local access to these amenities will determine the potential of the Project and its future complementary investments, particularly in the periphery districts, for decentralizing the economic and social opportunities in the city, taking advantage of the accessibility benefits in station areas. Complementary investments, goods, services and incentives will be required to provide high-quality public spaces, safe crossings, compact and diverse developments, and other elements of vibrant communities where people can safely walk, live, work, shop and play.

4. Third, the universal access analysis is performed by identifying benefits for those with mobility impairments and other vulnerable groups (such as persons with physically disabilities) the elderly and women in the direct area of influence of Metro Line 2. The World Bank through a PHRD grant (P129561) is currently supporting the Municipality of Lima in implementing a participatory and innovative design process to make the surrounding public space of at least one station of the *Metropolitano* BRT more accessible to people with mobility impairments as a pilot project. The lessons of this initiative have been incorporated into the Bank's technical assistance and implementation support plan for Lima Metro Line 2.

Socio-demographic and poverty characteristics of LMR

5. Lima has experienced rapid population growth accompanied by limited urban planning. The population of LMR has increased from 1.8 million inhabitants in the 1960's to 9.4 million in 2012. The population of Lima metropolitan region now accounts for close to one-third of the population in Peru. The city's population is spread irregularly over 2,800 square km, in 49 districts, 43 in the Lima Province and 6 in the Constitutional Province of Callao, each with administrative control over its jurisdictions. Although the annual population growth rate has stabilized somewhat in the past decade —to 2.1 percent, down from an annual average of 4 percent in the preceding three decades - projections made in the context of the latest household travel survey[57] indicate that the city's population will increase by close to 30 percent in the next 20 years, and this will potentially exacerbate existing social and economic spatial asymmetries. According to the study, by 2030, the population of the central districts will decrease while that of the outlying areas to the East and North will grow by 42 and 39 percent respectively. Added, to this, it is expected that the population growth rate in the 9 provinces of the Department of Lima will be higher than that of the consolidated urban areas, putting additional pressure on the urban structure and transportation requirements of the metropolitan region.

6. In the last decade, the metropolitan area has witnessed a sharp reduction in the monetary poverty rate. In line with other Peruvian cities, the number of people situated below the monetary poverty line in the LMR[58] has decreased from 25.1 percent in 2007 to 12.8 percent in 2013, while extreme poverty has become virtually inexistent. Inequality also fell from 0.46 to 0.41 in the same period, as measured by the GINI coefficient (only for the LMR)[59]. Finally, while other regions of the country have made more progress in boosting shared prosperity, income growth of the bottom 40 percent in the Lima has nonetheless surpassed that of the average population over the last decade growing by 5.5 percent against 4 percent for the average. In the LMR alone, there are 1.23 million people considered poor while an additional 1.7 million (20.9 percent of the total population) may be considered vulnerable as they earn monthly incomes of between 330 and 550 soles, which is only slightly above the subsistence level and just 23-40 percent of average household income in the LMR.

7. While pockets of poverty in the central areas of the LMR exist, the dispersed patterns of urbanization observed in the city have resulted in marked territorial and economic segregation, gentrification and social isolation of low-income households. As observed in Figure 1, the majority of low-income households reside in the Southern, Northern and Easternmost ¨Cones¨ where poverty rates are 17.7, 14.1, and 14.5 percent respectively, compared with 6.2 percent in the

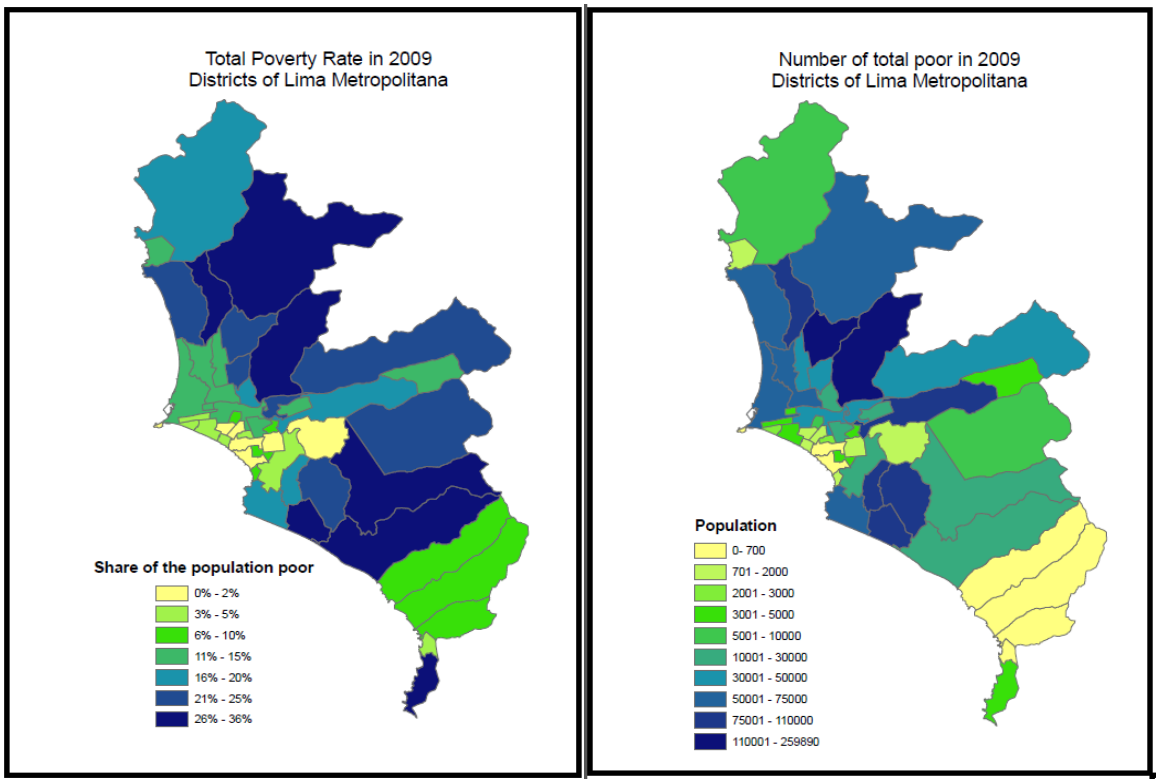
[57] Encuesta de Recolección de Información Básica del Transporte Urbano en el Área Metropolitana de Lima y Callao (2013). Nippon Koei Co., Ltd. y Nippon Koei Latin America. Agencia de cooperación Internacional del Japón (JICA). Actualización de la encuesta de hogares Origen-Destino (2004) y Plan Maestro de Transporte Urbano para el Área Metropolitana de Lima y Callao (PMTU – 2025) de 2005.

[58] The monetary poverty line in Peru is defined as the monthly per capita expenditure level that determines whether a household meets its basic consumption needs. This value consists of two components: the food component which is called also extreme poverty line (i.e. the value of food items in the representative consumer basket); and the non-food component. In 2009, the extreme and moderate poverty lines in LMR, were defined as per capita monthly consumption of less than 160 Soles and 324 Soles respectively.

[59] INEI 2013: http://www.inei.gob.pe/media/cifras_de_pobreza/pobreza_informetecnico2013_1.pdf

Center. Furthermore, there are as many as 14 districts in the LMR exhibiting poverty headcounts of over 20 percent. In absolute terms, though, the majority of low-income households are concentrated in just 7 districts. Four districts in the East[60] which will be served by the future Metro Line 2 and the feeder bus services[61] are home to about one third low-income households in the city. Accessibility constraints linked to this spatial mismatch exacerbates social inequality, chiefly through limited access to jobs by the urban poor.

Figure 1: Spatial distribution of poverty (relative and absolute consumption based measure) in the LMR (consolidated urban areas) in 2009



Source: INEI, Encuesta Nacional de Hogares 2009.

8. Such access to employment and associated services is particularly important for the poor; indeed, for the poor most travel is limited to economic, job-related or educational activities. Data from a 2012 travel survey (Figures 2 and 3) finds that trip rate of households belonging to the two bottom quintiles or *estratos* is much lower (33 percent) than that of the upper strata, and most of these trips relate to professional life (work), basic maintenance, and education (schooling and training).

[60] Ate, El Agustino, Santa Anita and, to a lesser extent San Juan de Lurigancho, which is already served by Line 1.
[61] It is important to underscore that the Project contemplates the construction and operation of Metro Line 2 but the organization of bus feeder systems and rearrangement of bus routes will depend on complementary activities described above.

Figure 2: Motorized and Non-motorized Trip by Income Level

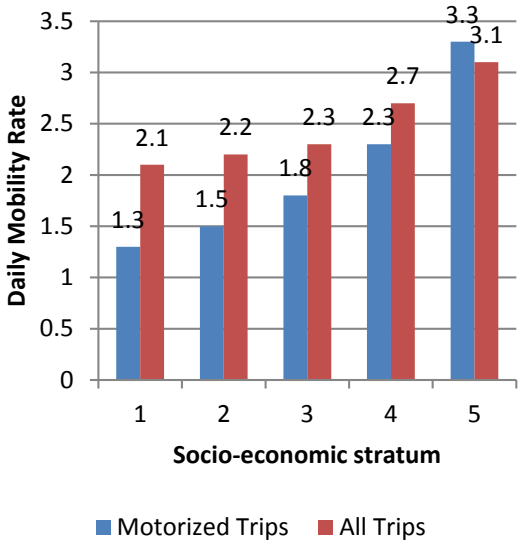
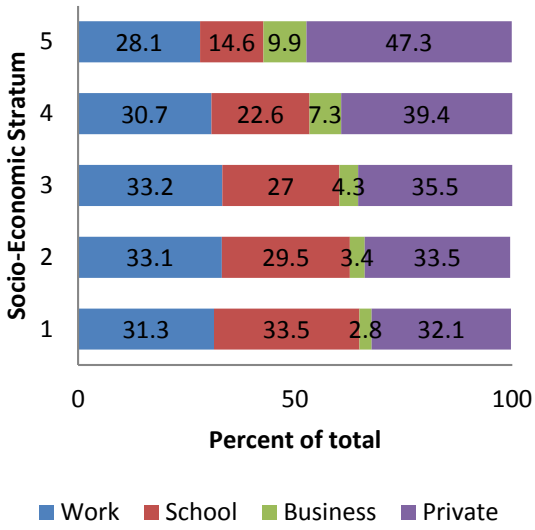


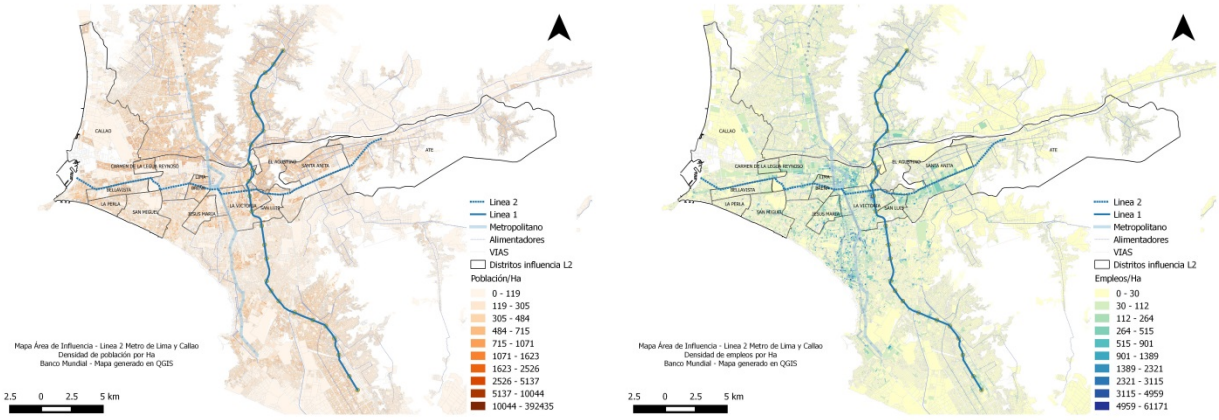
Figure 3: Trip Purpose by Income level



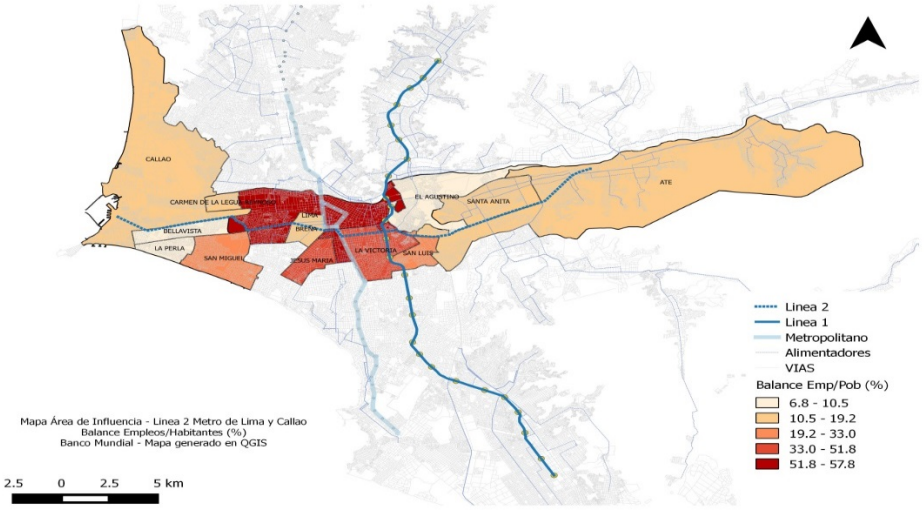
Source: JICA Origin-Destination Survey 2012

9. The spatial mismatch is evident because employment is heavily concentrated in the center with very few income-generating options in the formal sector available in the outlying ¨Cones¨. In other words, there more employers located in the central districts and these companies are significantly larger than the companies located in the periphery[62]. Looking at the direct area of influence of Metro Line 2, the job/housing balance of the Western and Eastern districts is much lower than the central ones (Figure 4).

Figure 4: Population and job density and job/housing balance (per District)



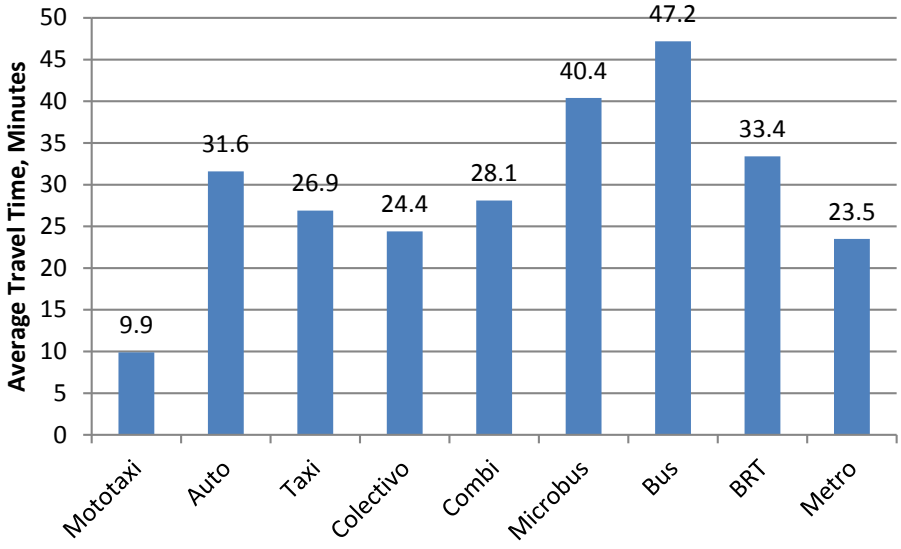
[62] Of close to 900,000 registered companies in the LMR, 40.3 percent are located in the central districts, compared to 20, 12.6 and 19.2 percent in the Northern, Southern, and Eastern districts. In other terms, while central districts like San Isidro, Lima, and Miraflores have between 300 and 350 firms per 1000 inhabitants, the poorer municipalities of Ate, San Luis de Lurigancho, and El Agustino have only between 55 and 70.



Source: INEI and AATE data, processed by World Bank.

10. This spatial concentration of formal jobs in the center and the poor living in the periphery manifests itself in high travel times on public transport, the primary travel mode for the poor (four fifths of inhabitants in the city do not have any type of vehicle, either four or two wheeler or non-motorized such as bicycles). This forces the poor living in the periphery to travel for longer distances and in multiple trips. The underserved peripheral districts of the North and East experience the longest commutes (45-50 minutes) while the average travel time in the central area is approximately 20-30 minutes. Figure 5 shows the average travel time per trip by mode. The average travel time of buses is as long as 47 minutes, followed by minibuses with 40 minutes on average.

Figure 5: Average travel time by mode



Source: Household Origin-Destination Travel Survey (2012)

11. Limited accessibility and the spatial mismatch may also be a driving force behind the city's high informality rate; the LMR has over 1.5 million of informal and own account workers (43 percent of the total labor force). Although informality in the LMR has multiple roots, one of them can be attributed to the existent spatial mismatch between jobs and residences whereby remote residential locations in the periphery with low accessibility effectively deters low income household, particularly women, from taking employment in the center of the city.

A Snapshot of Metro Line 2 direct area of influence

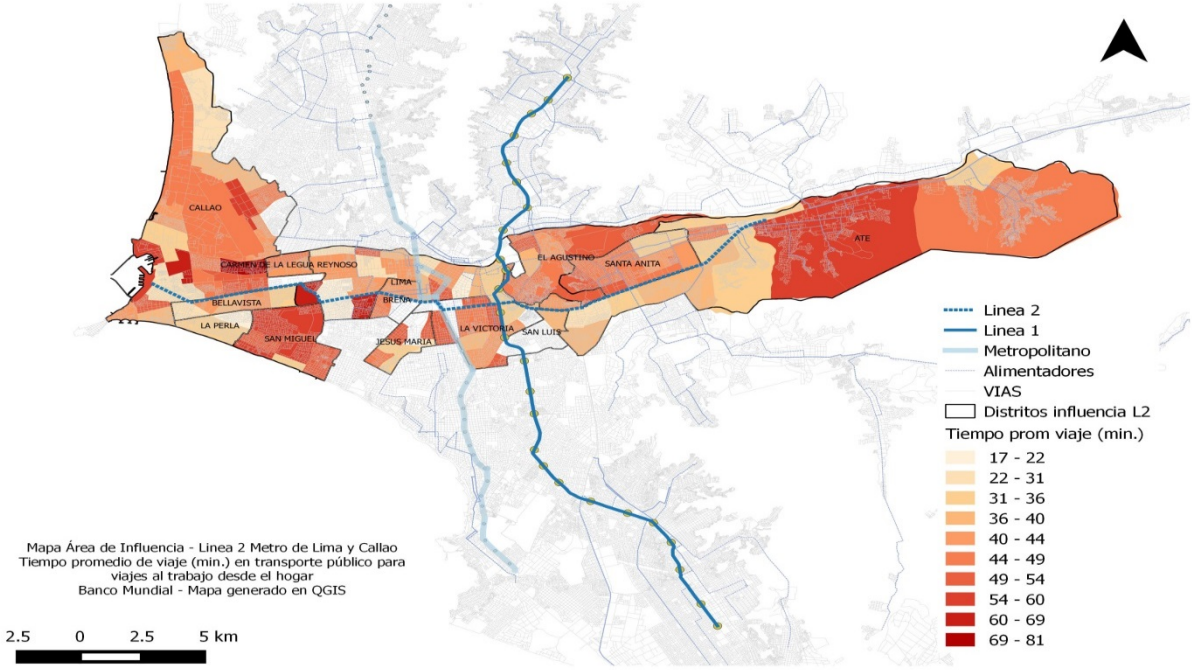
12. The direct area of influence defined as the 13 districts of Metro Line 2 routing, covers 111 km^2 with a population of 2.4 million, contains about 310,600 registered firms (38 percent of total), most of which are in the service sector, 24 percent of total educational establishments in LMR, and 26 percent of its health facilities. These 13 districts are home to about 576,000 households, of which 22 percent or 126,000 live below the poverty line. When taking into consideration other measures of poverty including such as the NBI[63], which consider sources of deprivation other than income and consumption, close to 121,000 households (25 percent) reside with at least one unmet need, but in some districts such as Ate as many as 41 percent or 47,000 households lived with at least one unmet need (INEI, 2007). Moreover, an additional 156,000 households in this area of influence are not considered poor, but in spite of being within per capita household income of between 380 and 550 soles per month are still considered vulnerable. When aggregating the poor, as per INEI definition of poverty and vulnerability, a total of 186,000 low-income inhabitants reside in the area of influence, or 32 percent of the total population in the 13 districts.

13. Focusing on travel patterns in this area of influence we see that the districts of Ate in the east and Callao or San Miguel in the west have the highest travel times based on actual travel patterns (household travel data). Average travel time for home-based work trips by transit is 45.5 minutes for the area of influence, and increases to 50.6 minutes for the eastern district of Ate (Figure 6). Further, trips originating in the western side of the Ate District take on average 19 percent more time (10 minute average difference) than the ones originating in the eastern side of the district. These eastern-side of the district trips (home-based work trips by transit) are 20 percent more local trips[64] than the ones of the west side of the district, with an average travel time 28 percent lower indicating the local nature of this work-rated mobility by the poor. Similar effects may also be present in the northern and eastern sides of Callao, Bellavista and La Perla districts. This analysis shows how accessibility constraints in the more peripheral residential locations of Ate District, are effectively deterring low income households from taking further away employment opportunities in more central areas of the city.

[63] Unsatisfied Basic Needs (NBI in Spanish) takes into consideration non-monetary variables which are correlated with poverty such as dwelling characteristics, sanitation, and school enrollment.

[64] Local trips are defined by destinations within the east side of LMR; all traffic analysis zones within, north and south of El Agustino, Santa Anita and Ate districts.

Figure 6: Average travel time for home-based work trips by transit in the Metro Line 2 area of influence



Source: Household Origin-Destination Travel Survey (2012), processed by World Bank.

14. In summary, Lima has evolved spatially such that the poor living on the urban peripheries have to travel an unreasonable amount of time, often at high cost to gain access to sources of income of the formal or informal sector and to health and educational institutions. The data suggest that for those living at the extreme periphery this lack of accessibility is a binding constraint and some of this population is being excluded from city-wide social and economic opportunities.

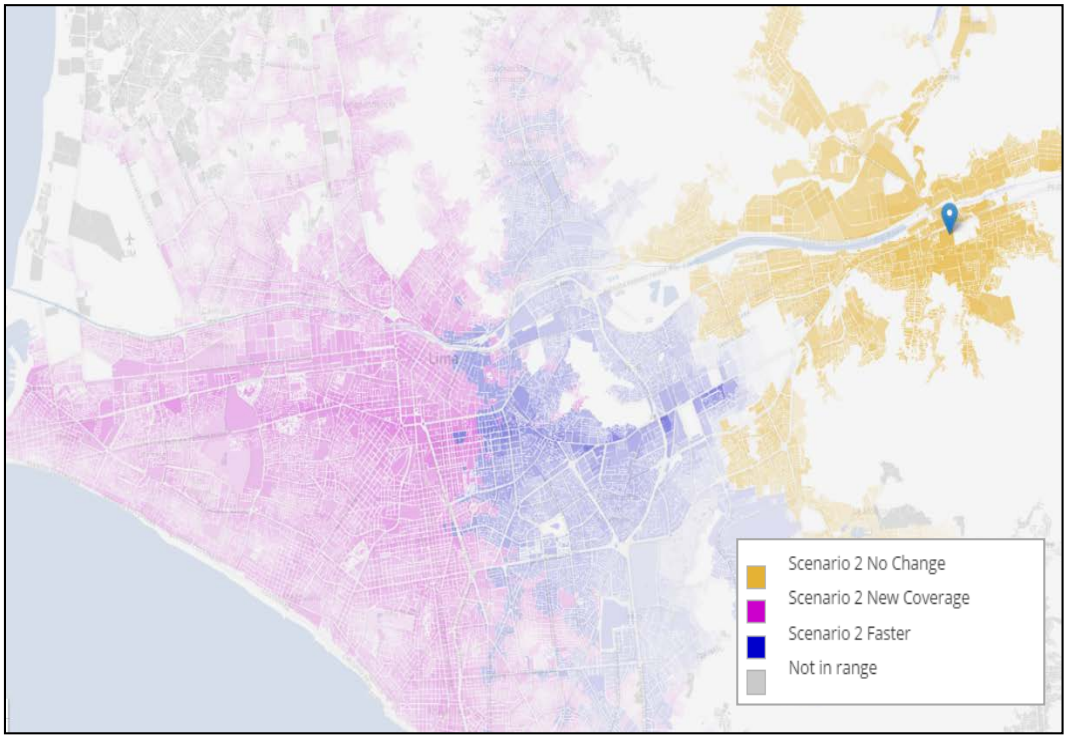
Regional accessibility analysis

15. The primary direct benefit of the Project is an enhanced accessibility to jobs and services for the poor living in the east and west peripheries. This benefit will be experienced primarily in the form of reduced travel times for public transport users in the area of influence of Metro Line 2 (Mobility PDO), including transfer and access time. For Metro Line 2 users who relied on road-based public transport, the expected travel time savings is on the order of 50-70 percent depending on the trip origin and destination. For example, traveling between the two more distant stations of the Metro Line 2 (Ate and Callao) can currently take up to 120 minutes in the traditional bus-based public transport. Once the Metro Line 2 is operational, the 27-km stretch will be completed in 45 minutes, enabling residents in the periphery to access jobs in the center and providing all riders time savings that can be used in other productive activities or leisure time with their families. This is a direct mobility benefit along the intervened corridor to be capitalized into a regional accessibility dimension.

16. One key regional accessibility indicator is the number of jobs reachable by public transportation within a 60 minute one-way commute in the area of influence of Metro Line 2. To analyze the regional accessibility implications of Metro Line 2, the employment opportunities

available through the integrated transit network were estimated for each part of the city, before and after the Project. Combining travel times for every origin-destination point within LMR with the spatial distribution of employment, number of jobs accessible within a given time frame, using only the transit network, were estimated. For example, changes in employment accessibility for people living in the selected location of Ate District (Figure 7). A household located on the easternmost edge of the Ate District could only access those areas colored in yellow and blue with the existing transit system in a 60 minutes period. With the introduction of the high capacity mode, the blue areas can be accessed faster, but more importantly, within the same 60 minute commute, the public transport user can now travel to previously unreachable areas (colored in pink), where more jobs tend to be located. In other words, the introduction of Metro Line 2 significantly expands job accessibility, mitigating the existing spatial mismatch in the LMR.

Figure 7: Employment catchment areas for 60-minute commute trips from a selected location in Ate District

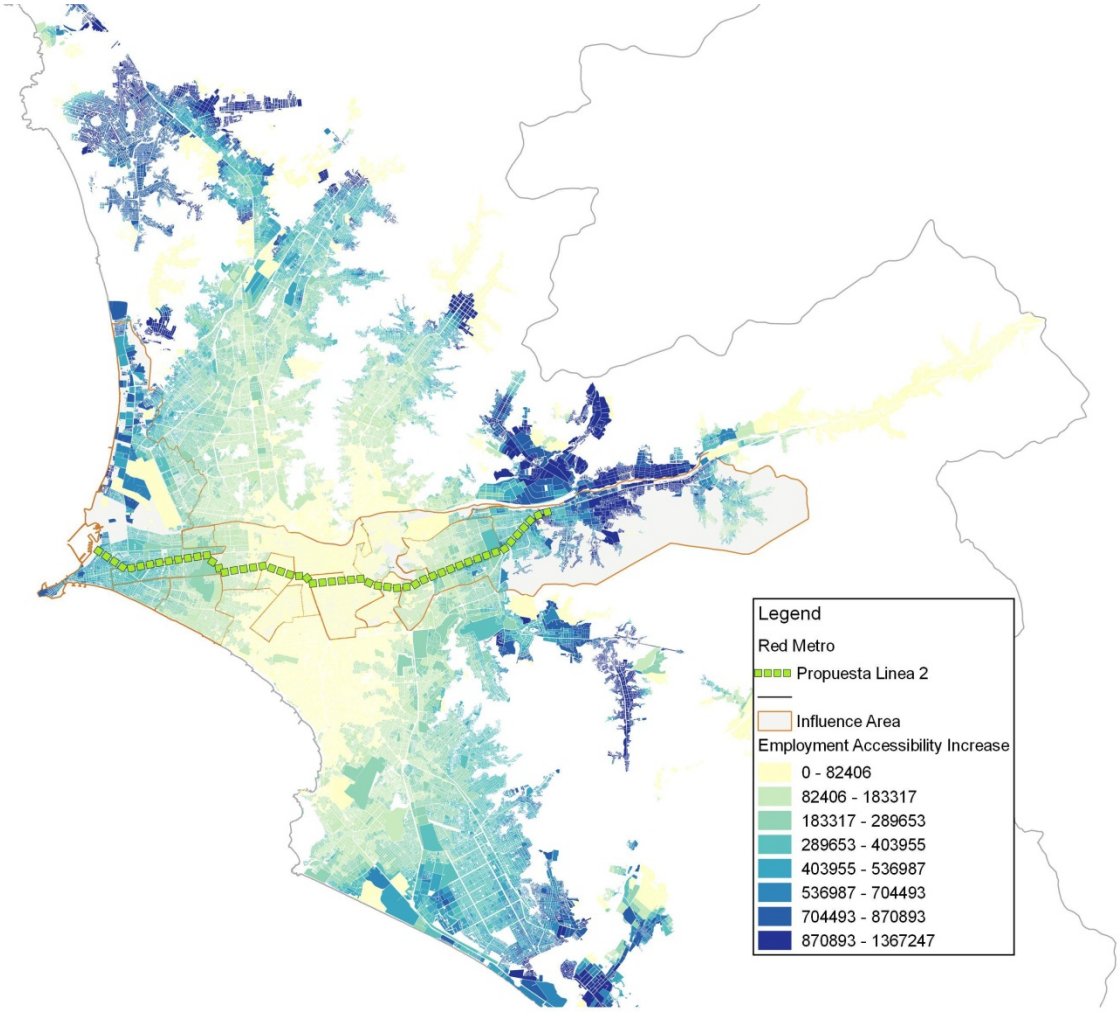


Source: Household Travel Survey (2012) and INEI data, processed by World Bank.

17. When combined with the Metro Lines 1 and the *Metropolitano*, in addition to the future integrated urban and inter-municipal feeder services, the number of jobs available within a 60-minute commute could increase by as much as 25 percent. Future reorganization of bus routes will ensure that Metro Line 2 becomes the backbone of the system, hence ensuring that time-savings accrue to those residents located in the lower income settlements. For example, residents of the districts of Ate, Santa Anita, Lurigancho and San Juan de Lurigancho, and El Agustino, can currently access approximately 960,000 jobs in 60 minutes through a combination of travel modes. Once Metro Line 2 is operational and fully integrated with other high and low capacity modes, a total of 1.2 million jobs may be accessible in the same amount of travel time in the best case scenario, further evidencing the Project's potential for enabling disadvantaged groups to have more

formal income generating opportunities within the same travel time (Figure 8). The envisaged public transport system will also reduce travel time to major hospitals, museums, universities and supermarkets throughout the city.

Figure 8: Employment accessibility improvements within 60 minutes resulting from Metro Line 2 Construction



Source: Household Travel Survey (2012) and INEI data, processed by World Bank.

The issue of cost and affordability. While Metro Line 2 has the potential to dramatically enhance the accessibility of residents in the east and west periphery to jobs and services by significantly reducing travel times; the issue of travel cost and affordability will also need to be addressed in order to realize this potential. While current expenditures on transport (as per the 2012 travel survey) for the poor, estimated at about 9 percent of household income for the bottom 40 percent, are on the low end of the range for Latin American metropolitan areas[65]; and Metro Line 2 would offer a significantly higher quality alternative; it will be important to ensure that affordability does not become a barrier for Metro use. This is particularly important because the indicative fare on the Metro Line 2 (a final decision is still under consideration) is expected to be in the range of 2.5 soles, considerably higher than the fare on current micro-buses which range from 0.7 for local trips to 1.5 soles for longer trunk trips. However, the current system is not integrated and long trips often require multiple transfers. The travel survey data indicate that trips from the peripheral zones require more transfers than the rest of the region. Thus, for many travelers the 2.5 soles integrated fare on the mass transit system may actually reduce total travel costs. This may be particularly true for women who tend to be engaged in multi-leg trips to a variety of destinations and for different purposes such as childcare, household management, and informal sector employment (Booth et al., 2000; World Bank, 2002)—all of which making their movements on public transport relatively expensive in the absence of an integrated fare allowing sufficient time for inter-modal transfers.

But others may see a net cost increase if they need to pay for transfers on *combis* or microbuses in addition to the Metro fare. This is an important concern that reinforces the rationale for integrating the Metro system with the rest of the public transport in the region; the benefits and affordability of the Metro would be significantly enhanced as part of an integrated public transport system. Finally, for some the 2.5 soles fare maybe unaffordable, and solutions such as targeted subsidies may need to be developed.

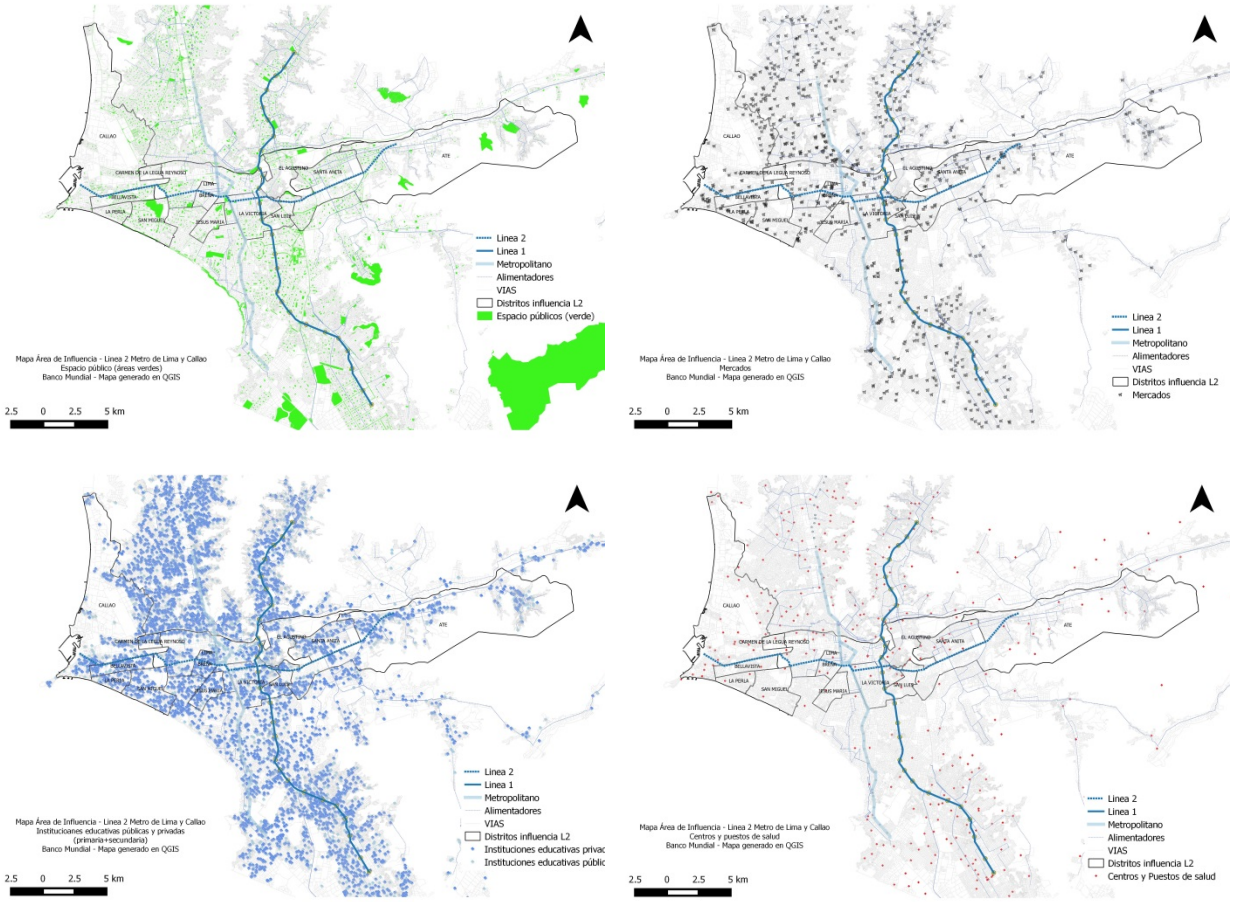
The Bank team has started a discussion with Government on the issues of integration and affordability; and it is expected that facilitating an affordable integrated system will be a central element of the Bank's implementation support agenda and an essential element of the value proposition of Bank involvement in the project.

Local accessibility analysis

18. Local accessibility benefits will be generated in the area of influence of Metro Line 2 stations, improving the living conditions of the poor by transforming the built environment of surrounding neighborhoods, if complementary investments are carried out. Local access to amenities and services, associated to broader local economic development opportunities and social benefits and to livable and vibrant neighborhoods, such as high-quality public open (green) spaces and facilities for education (private and public schools), health (local health centers) and groceries (local markets) are mapped across all the LMR (Figure 9).

[65] In Sao Paulo, for instance, low-income users of the city´s integrated mass transit system spent 19.7 percent of their income on public transport in 2006 with much higher shares before the integrated tariff was introduced (Rebelo, 2007). In Bogota, the 2010 Mobility Survey found that lower strata devoted 16 percent of their revenue to public transport. In Santo Domingo, the studies carried out after the inauguration of the Metro in 2009 found that the population earning less than the minimum wage, which made out 19% of metro riders, allocated up to 20 percent of their income to purchase 50 metro trips each month (Allen, 2010).

Figure 9: Public green (open) space, local markets, schools and local health centers

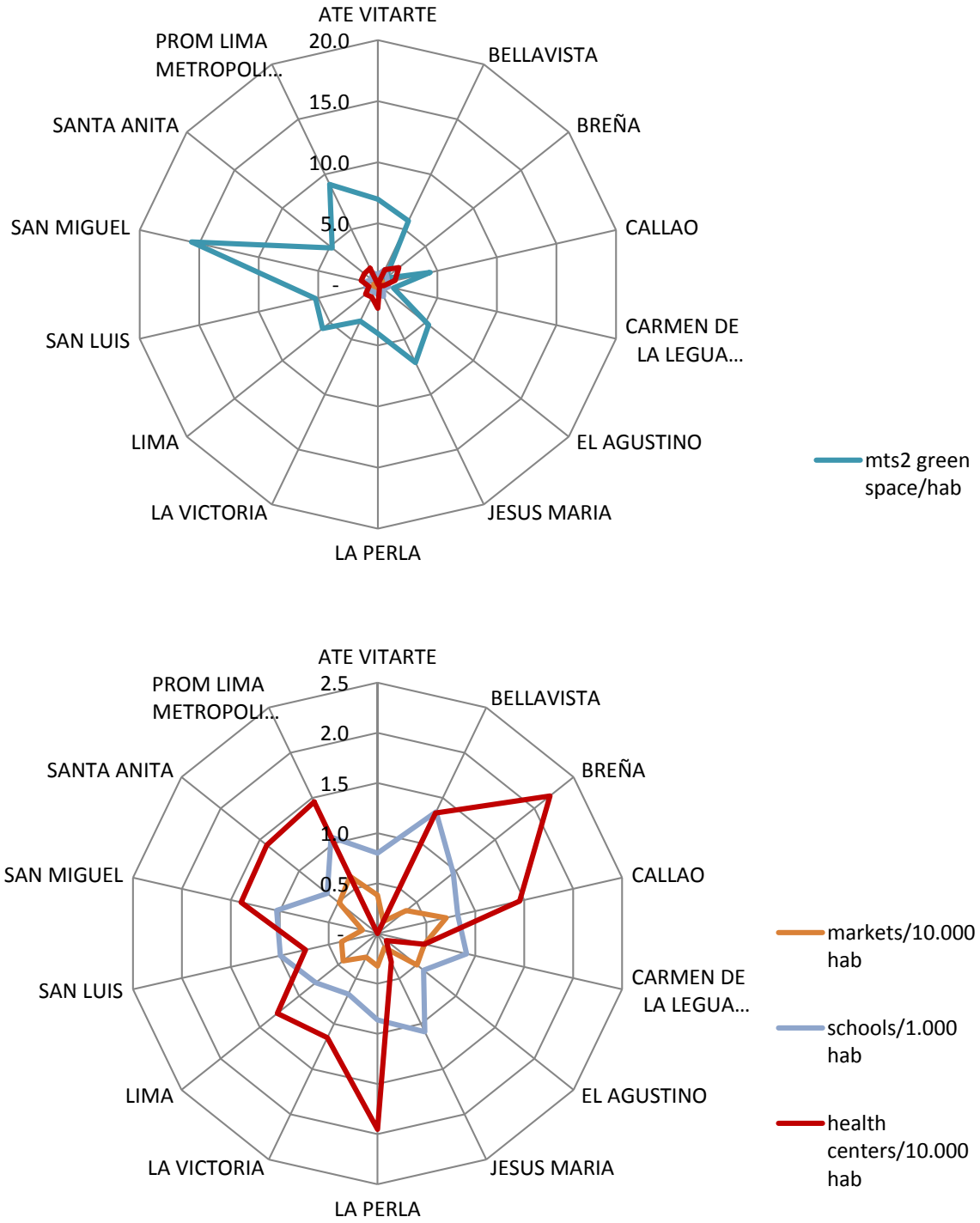


Source: PLAM 2035 data, processed by World Bank.

19. Then the local availability of these amenities on the 13 districts of the area of influence of Metro Line 2 are compared and against the LMR average (Figure 10). In terms of local access to public open (green) spaces[66], the District of San Miguel has 16 m^2/hab., more than the LMR average (9 m^2/hab.) due to the location of the *Parque de las Leyendas* (a botanical and zoo garden), followed by Jesus Maria and Ate districts with 7 m^2/hab. The rest of the districts have an average below the regional average of LMR. The District of Breña is below 1 m^2/hab. In terms of local markets, only the District of Callao (0.7 markets/10.000 Hab.) has a higher availability per capita compared the LMR average (0.63 markets/10.000 Hab.), compared to Bellavista (0.13 markets/10.000 Hab.), San Miguel and Jesus Maria (0.16 markets/10.000 Hab.) with the lowest numbers in the area of influence of Metro Line 2. Finally, two of the eastern districts (Ate and El Agustino) score very low in terms of availability of local health centers per capita (0 and 0.11 health centers/10.000 Hab.) compared to the LMR average (1.46 health centers/10.000 Hab.).

[66] The main two National Parks (*Parque Nacional Antonio Raymondi* and *Parque Paul Paulet*) where excluded from the calculations since they do not represent local amenities such as metropolitan, zonal or local parks.

Figure 10: Gap of local amenities and services for the 13 districts – Metro Line 2



Source: PLAM 2035 data, processed by World Bank.

20. The gap on local access to these amenities will determine the potential of the Project and its future complementary investments, particularly in the periphery districts, for decentralizing the economic and social opportunities in the city, taking advantage of the accessibility benefits in station areas. Complementary investments, goods, services and incentives will be required to provide high-quality public spaces, safe crossings, compact and diverse developments, and other elements of vibrant communities where people can safely walk, live, work, shop and play.

Universal accessibility

21. For poor people, and particularly for women, children, and the elderly, trip making is often deterred because of their vulnerability as pedestrians, both to traffic accidents and to personal violence, making them "safety poor" (World Bank, 2002). The situation is even more critical for people with disabilities, which constitute over 10 percent of the population in the LMR[67]. Solving the transport difficulties of disabled people is a normative imperative, but can also lead to productivity gains. Since people with disabilities are more likely to never leave their homes than able-bodied adults due in part to transport barriers, they are commonly left out of the job market at immense economic costs for society as a whole. Accordingly, enhancing opportunities for people with disabilities and tackling their "repressed demand" for public transport is justified on both equity and efficiency grounds.

22. In improving services to individuals with disabilities, the design plans of the Lime Metro Line 2 have identified measures tailored at the needs of people with disabilities, analyzing such factors as high ridership, transfer points, and service to major areas of activity. One key goal is to expand accessibility features for the disabled. All stations of Line 2 will include features that improve accessibility for customers with temporary and permanent visual, hearing, and mobility disabilities. These include:

- elevators or ramps
- handrails on ramps and stairs
- large-print and tactile signs
- audio and visual information systems
- accessible station booth windows
- accessible vending machines
- accessible service entry gates at metro stations
- platform gap modifications or bridge plates to reduce or eliminate the gap between trains and platforms

23. The Line 2 Project is also an opportunity to showcase universal accessibility measures and participatory planning methods being piloted by the World Bank through a PHRD grant in Lima (P129561). Affordable, safe, and reliable transportation will allow the maximum number of people to gain access to important opportunities in education, employment, healthcare, housing, and community life. Of particular importance are the transfer stations between the proposed Line 2 and the existing *Metropolitano* and Line 1 network. The stations should be designed with minimal hindrances for people in wheelchairs or crutches or parents with small children to walk a short distance to transfer.

[67] INEI, Encuesta Nacional sobre discapacidad 2012.

Annex 8: Maps of Lima's Metro Network and Metro Line 2 Alignment

PERU: Lima Metro Line 2 Project

Figure 1: Lima's Future Metro Network Plan
(Source: AATE)

Figure 2: Area of Influence for Proposed Metro Line 2 and Branch Line 4 (Source: Project Feasibility Study)

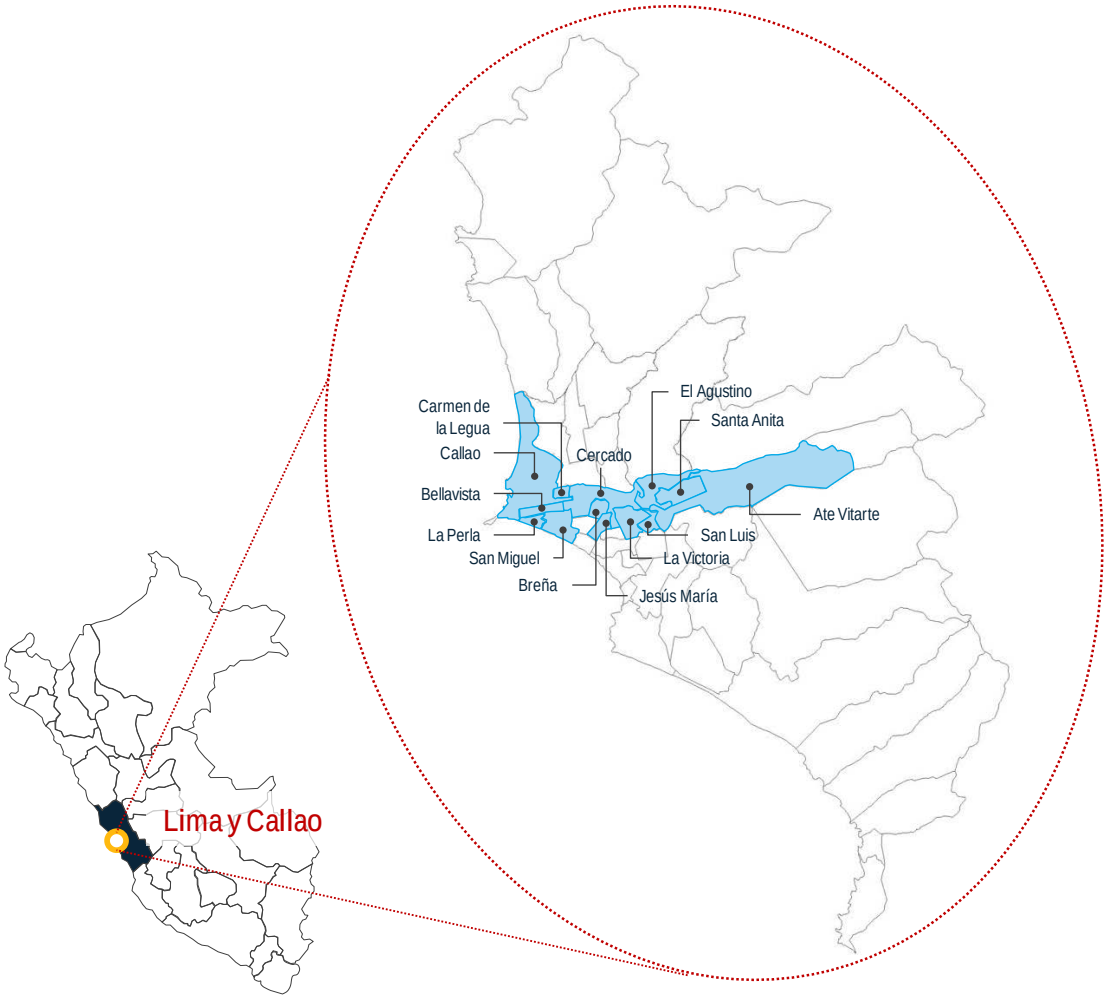


Figure 3: Selected Alignment for Metro Line 2 (and Line 4 Branch), Integration Points and Feeder Network with COSAC (Metropolitano BRT) and Metro Line 1 (Tren Electrico) (Source: Project Feasibility Study)